Veritas™ Cluster Server Installation Guide

AIX

5.0

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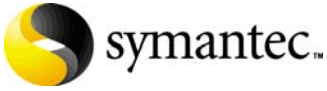

Veritas Cluster Server Installation Guide

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Veritas Cluster Server 5.0

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Technical support

For technical assistance, visit http://support.veritas.com and select phone or email support. Use the Knowledge Base search feature to access resources such as TechNotes, product alerts, software downloads, hardware compatibility lists, and our customer email notification service.

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Chapter 9 Installing VCS on a single node

Appendix A Advanced topics related to installing VCS

Appendix B Sample VCS installation and configuration output

Chapter 1

Introducing VCS

This chapter contains the following topics:

About VCS

Veritas™ Cluster Server by Symantec is a high-availability solution for cluster configurations. Veritas Cluster Server (VCS) monitors systems and application services, and restarts services when hardware or software fails.

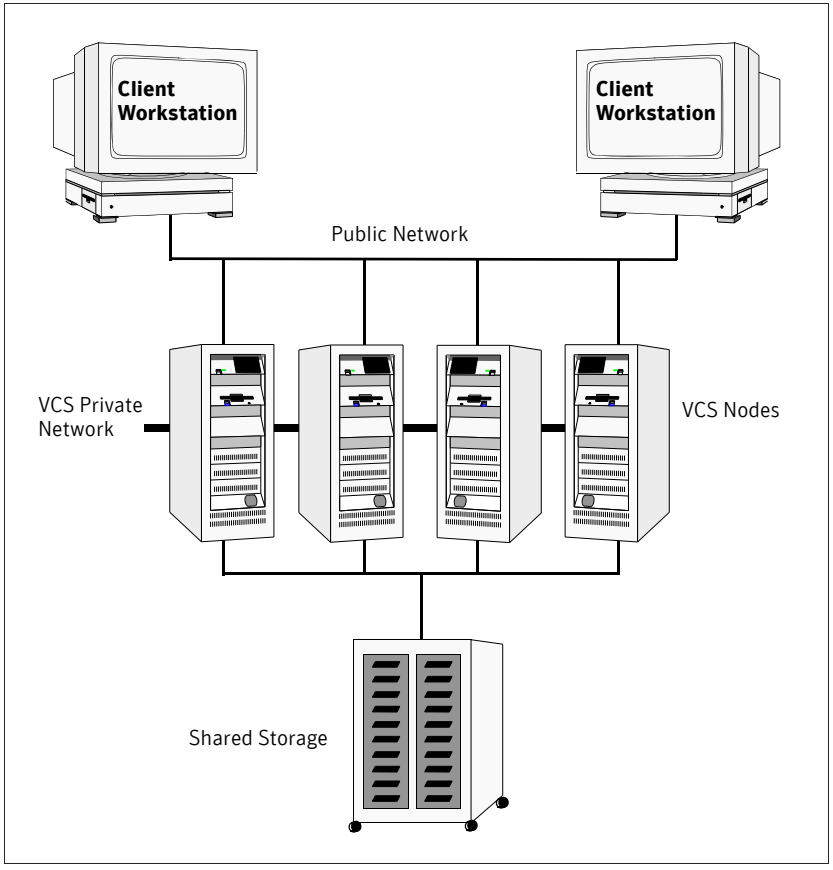
VCS basics

A single VCS cluster consists of multiple systems connected in various combinations to shared storage devices. When a system is part of a VCS cluster, it is a node. VCS monitors and controls applications running in the cluster on nodes, and restarts applications in response to a variety of hardware or software faults.

Client application continue operation with little or no downtime. In some cases, such as NFS, this continuation is transparent to high-level applications and users. In other cases, a user might have to retry an operation, such as a web server reloading a page.

Figure 1-1 illustrates a typical VCS configuration of four nodes connected to shared storage. Client workstations receive service over the public network from applications running on VCS nodes. VCS monitors the nodes and their services. VCS nodes in the cluster communicate over a private network.

Figure 1-1 Example of a four-node VCS cluster



Multiple nodes

VCS runs in a replicated state on each node in the cluster. A private network enables the nodes to share identical state information about all resources and to recognize active nodes, nodes that are joining or leaving the cluster, and failed nodes. The private network requires two communication channels to guard against network partitions.

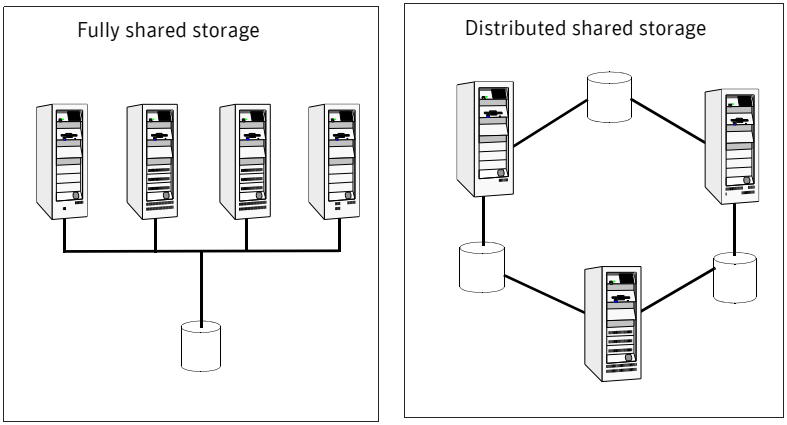
Shared storage

A VCS hardware configuration typically consists of multiple nodes connected to shared storage through I/O channels. Shared storage provides multiple systems

with an access path to the same data, and enables VCS to restart applications on alternate nodes when a node fails, which ensures high availability.

Figure 1-2 illustrates the flexibility of VCS shared storage configurations. VCS nodes can only access physically-attached storage.

Figure 1-2 Two examples of shared storage configurations



LLT and GAB

VCS uses two components, LLT and GAB, to share data over private networks among systems. These components provide the performance and reliability that VCS requires.

- LLT (Low Latency Transport) provides fast, kernel-to-kernel communications, and monitors network connections. The system administrator configures LLT by creating the configuration files /etc/llthosts, which lists all the nodes in the cluster, and /etc/lltab, which describes the local system's private network links to the other nodes in the cluster.
- GAB (Group Membership and Atomic Broadcast) provides the global message order required to maintain a synchronized state among the nodes. It monitors disk communications such as the VCS heartbeat utility. The system administrator configures the GAB driver by creating a configuration file (/etc/gabtab).

See "Verifying LLT and GAB configuration files" on page 151.

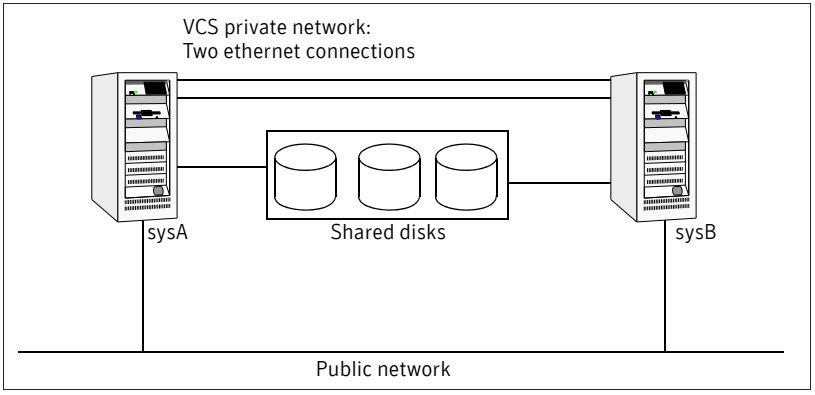
Network channels for heartbeating

For the VCS private network, two network channels must be available for heartbeating. These network connections are also used for transmitting information.

Each AIX cluster configuration requires at least two network channels between the systems. The requirement for two channels protects your cluster against network partitioning. Refer to the *Veritas Cluster Server User's Guide* for more information on network partitioning.

Figure 1-3 illustrates a two-node VCS cluster where sysA and sysB have two private network connections.

Figure 1-3 Two nodes connected by two ethernet connections



Preexisting network partitions

A preexisting network partition refers to a failure in communication channels that occurs while the systems are down and VCS cannot respond. When the systems are booted, VCS is vulnerable to network partitioning, regardless of the cause of the failure.

VCS seeding

To protect your cluster from a preexisting network partition, VCS uses a seed. A seed is a function of GAB that determines whether or not all nodes have joined a cluster. For this determination, GAB requires that you declare the number of nodes in the cluster. Note that only seeded nodes can run VCS.

GAB automatically seeds nodes when:

- An unseeded node communicates with a seeded node
- All nodes in the cluster are unseeded but can communicate with each other

When the last system starts and joins the cluster, the cluster seeds and starts VCS on all nodes. You can then bring down and restart nodes in any combination. Seeding remains in effect as long as at least one instance of VCS is running somewhere in the cluster.

You need to perform a manual seed to run VCS from a cold start (all systems down) when one or more systems of the cluster are unavailable. VCS does not start service groups on a system until it has a seed.

Chapter 2

Preparing to install and configure VCS

This chapter contains the following topics:

About preparing to install VCS 5.0

Before you install any product, read the following Veritas Technical Support TechNote for the latest information on updates, patches, and software issues regarding this release:

http://support.veritas.com/docs/282024.

To find information on supported hardware, see the hardware compatibility list (HCL) in the following TechNote:

http://support.veritas.com/docs/283282

About VCS 5.0 features

To configure the optional features of the VCS components, make sure to install all filesets when the installation program prompts you. Review the description of the optional features and decide the features that you want to configure with VCS:

- Symantec Product Authentication Service
- Veritas Cluster Management Console
- SMTP email notification for VCS events
- SNMP trap notification for VCS events
- Global clusters using VCS
- I/O fencing

Symantec Product Authentication Service

Symantec Product Authentication Service secures communication between cluster nodes and clients, including the Java console, by using digital certificates for authentication and SSL to encrypt communication over the public network. For more information about the Authentication Service, see the *Veritas Cluster Server User's Guide*.

To configure the cluster in secure mode, VCS requires you to configure a system in your enterprise as root broker and all nodes in the cluster as authentication brokers.

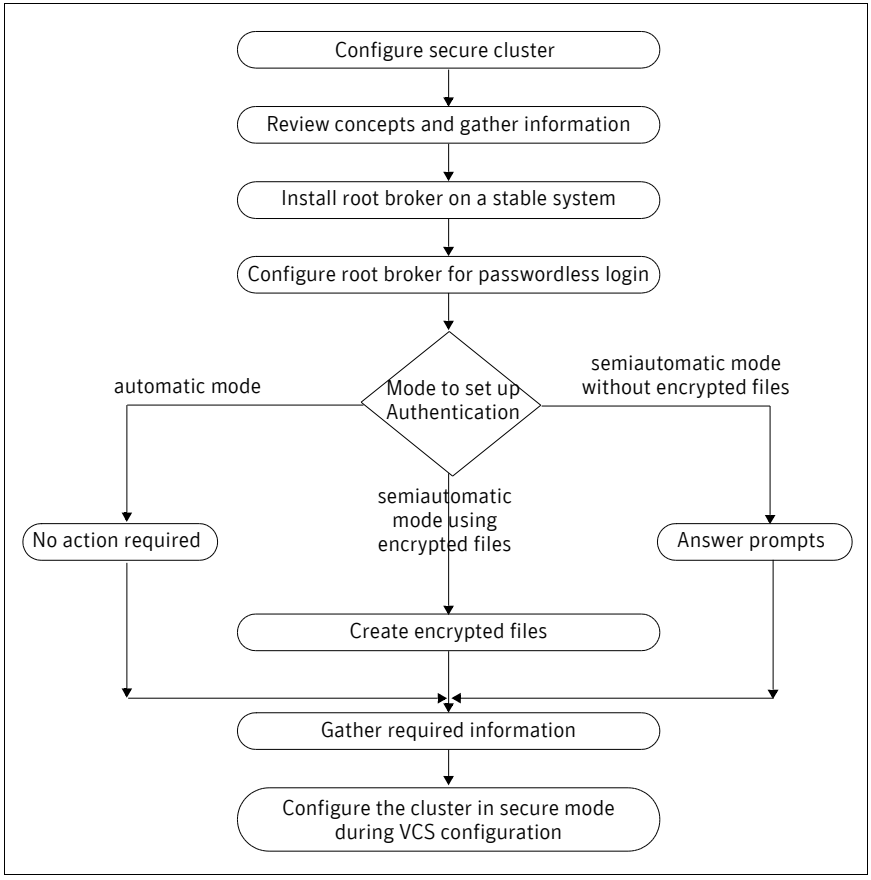
- Root broker
  A root broker serves as the main registration and certification authority; it has a self-signed certificate and can authenticate other brokers. The root broker is only used during initial creation of an authentication broker.
- Authentication brokers
  Authentication brokers serve as intermediate registration and certification authorities. Authentication brokers have certificates that are signed by the root. Each node in VCS serves as an authentication broker.

You can set up Authentication Service for the cluster during the installation or after installation. Refer to the *Veritas Cluster Server User's Guide* to configure the cluster in secure mode after the installation and configuration process.

See "Configuring the cluster in secure mode" on page 66.

Figure 2-4 depicts the flow of configuring VCS in secure mode.

Figure 2-4 Secure VCS cluster configuration flowchart



If you decide to enable Authentication Service, the root broker administrator must perform the following preparatory tasks:

- Install the root broker on another stable system.
  The root broker is the main registration and certification authority and can serve multiple clusters. Symantec recommends that you install a single root broker on a utility computer such as an email server or domain controller, which can be highly available.
  See "Installing root broker for Symantec Product Authentication Service" on page 34.
- Configure the root broker system for a passwordless login when you want to use the automatic mode.

The installvcs program provides the following modes to enable Symantec Product Authentication Service:

- In the automatic mode, the installer configures Authentication Service automatically without any user intervention.
  You must provide the name of the root broker system.
- In the semiautomatic modes, the installer provides you an option to use encrypted files or answer the installer prompts to enable security. The semiautomatic mode requires the root broker administrator to set up the basic authentication environment and create principals for authentication brokers. You must complete the following preparatory tasks to configure security in the semiautomatic mode:

With encrypted file	■ The root broker administrator must create an encrypted file for each node in the cluster. See "Creating encrypted files for Symantec Product Authentication Service" on page 35. ■ You must fetch the encrypted files from the root broker administrator and copy the encrypted files to the installation node. Make a note of the path of these encrypted files.
Without encrypted file	■ You must gather the following information from the root broker administrator: - Root broker name - Root broker domain name - Root broker port (Default is 2821) - Authentication broker principal name for each node - Authentication broker password for each Authentication broker ■ You must fetch the root_hash file from the root broker system and copy the root_hash file to a directory in the installation node. Make a note of the path of this root_hash file.

Note: Make sure that the system clocks of the rook broker and authentication brokers are in sync.

Veritas Cluster Management Console

Veritas Cluster Management Console is a high availability management solution that enables monitoring and administering clusters from a single web console.

You can configure Cluster Management Console to manage a single cluster, multiple clusters, or both.

- If you want to use Cluster Management Console to manage multiple clusters, you must set up a management server.
- If you want to use the Cluster Management Console to manage a single cluster, choose the option to install the Cluster Management Console during VCS installation and configuration.

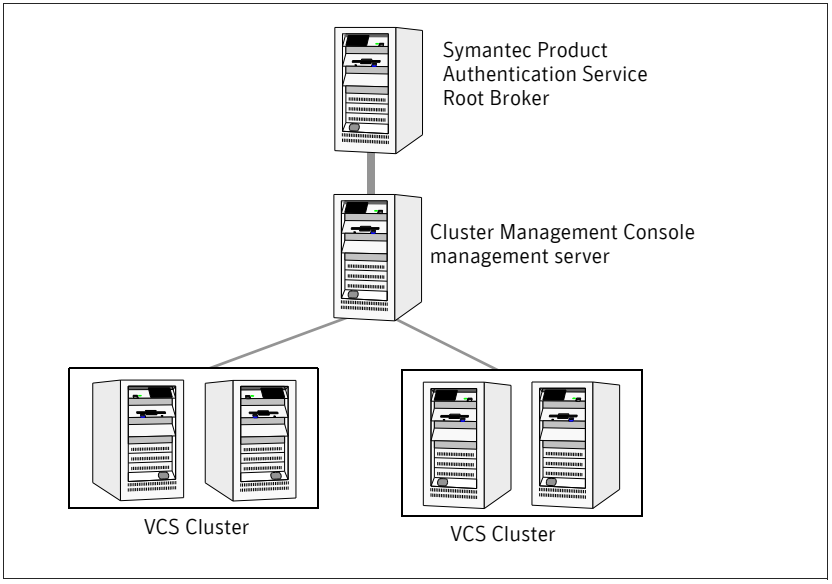
Operational mode	Configurational description
Local management of one cluster (single-cluster mode)	The Cluster Management Console is installed along with VCS on each node in the cluster and is configured for failover. It is integrated with VCS as part of the ClusterService service group. The Cluster Management Console offers robust cluster management capability and can be run from any supported Web browser on any system. See "Configuring the Cluster Management Console" on page 69.

Operational mode	Configurational description
Centralized, comprehensive, enterprise-wide administration of multiple clusters (multi-cluster mode)	One instance of the Cluster Management Console is installed outside all clusters on a standalone server. The console enables users to visually and intuitively input commands to the multi-cluster management engine, the *management server*. The management server initiates monitoring and management actions based upon those commands. The management server uses a database to store cluster configurations, cluster status, events, event policies, report jobs, report outputs, and more. See "Installing the management server for the Veritas Cluster Management Console" on page 37. If the management server and cluster nodes are separated by a firewall, a component called *cluster connector* is installed on each cluster node. Cluster connector enables communication with clusters through firewalls. Cluster connector also provides buffering for cluster data. If the console goes offline and then comes back online, it can retrieve data collected during the offline period from the cluster connector buffer. See "Configuring cluster connector" on page 68. The console offers additional capability for administering users, reports, events, and notification. If the cluster environment includes licensed VCS global clusters, disaster recovery (DR) capability is also available.

The configurational differences between the operational modes mean that you cannot switch a single Cluster Management Console installation from one mode to the other. The modes are also incompatible on the same system. Consequently, one system cannot offer both operational modes. However, the modes *can* co-exist in the same multi-cluster environment, with single-cluster-mode installations on VCS cluster nodes, and multi-cluster-mode installations on management server hosts. Such a deployment can be desirable if different IT administrators in your enterprise have different scopes of responsibility.

See *Veritas Cluster Server Centralized Management Guide* for more information.

Figure 2-5 Sample deployment for Veritas Cluster Management Console



SMTP email notification for VCS events

You have the option to configure SMTP email notification of VCS events by the VCS Notifier component. If you choose SMTP notification, be ready to answer prompts for the following information:

- The domain-based address of the SMTP server that is to send notification email about the events within the cluster, for example: smtp.symantecexample.com.
- The email address of each SMTP recipient to be notified, for example: john@symantecexample.com.
- The minimum severity of events for SMTP email notification. Events have four levels of severity: Information, Warning, Error, and SevereError.

Refer to the *Veritas Cluster Server User's Guide* for more information on SMTP notification.

SNMP trap notification for VCS events

You have the option to configure SNMP trap notification of VCS events by the VCS Notifier component. If you choose SNMP notification, be ready to answer prompts for the following information:

- The port number, 162 by default, for the SNMP trap daemon.
- The system name for each SNMP console.
- The minimum severity of events for SNMP trap notification. Events have four levels of severity: Information, Warning, Error, and SevereError.

Refer to the *Veritas Cluster Server User's Guide* for more information on SNMP notification.

Global clusters using VCS

Global clusters provide the ability to fail over applications between geographically distributed clusters when disaster occurs. You require a separate license to configure global clusters. You must add this license during the installation.

If you choose to configure global clusters, the installer enables you to choose whether or not to use the same NIC, virtual IP address, and netmask as are configured for the ClusterService group, which are the defaults. If you choose not to use the same networking information, you must specify appropriate values for the NIC, virtual IP address, and netmask when you are prompted.

I/O fencing

I/O fencing protects the data on shared disks. When nodes in a cluster detect a change in cluster membership that could indicate a split brain condition, the fencing operation proceeds to determine which nodes are to retain access to the shared storage and which nodes are to be ejected from the cluster, thus preventing possible data corruption. The *Veritas Cluster Server User's Guide* describes I/O fencing concepts in detail. The installvcs program installs the VCS I/O fencing driver, VRTSvxfen.

Note: Symantec strongly recommends that you use VCS I/O fencing to deter potential split brain scenarios in your cluster.

See "Setting up I/O fencing" on page 119.

Preparing to install VCS 5.0

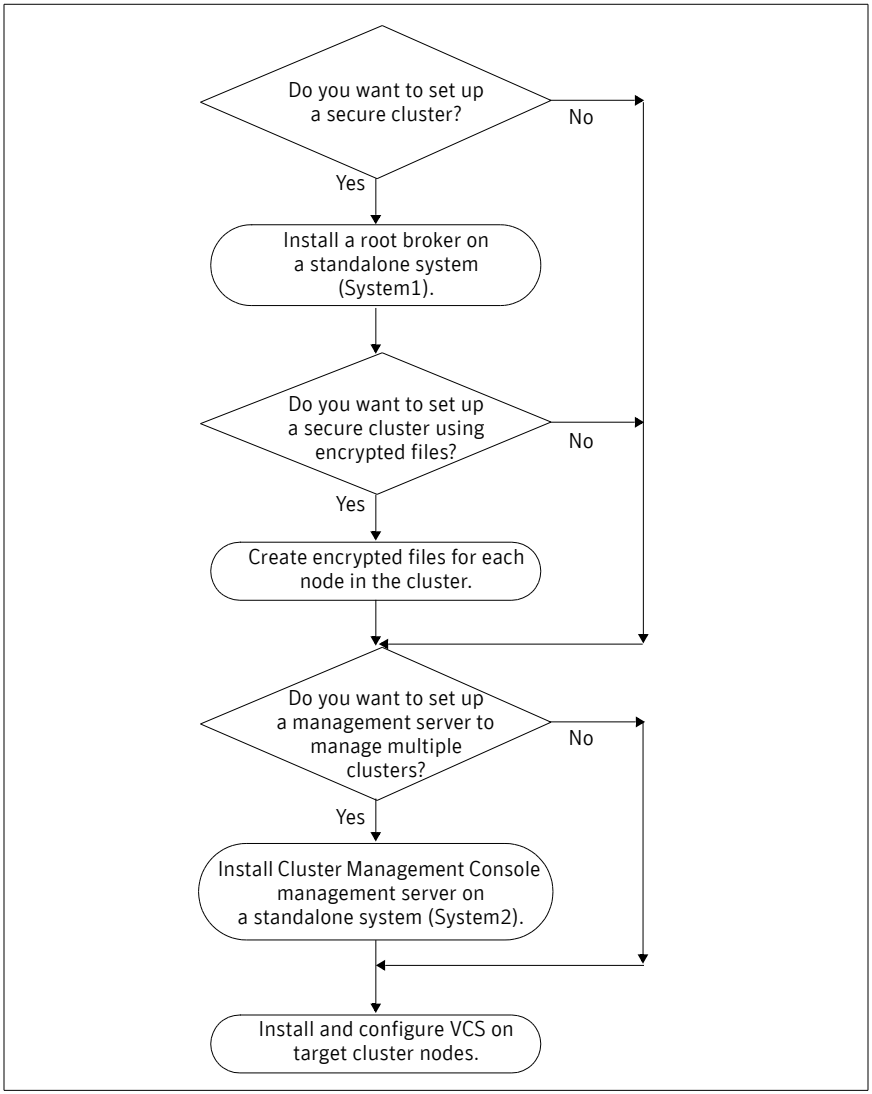
Each node on which you want to install VCS must meet the hardware and software requirements.

- "Hardware requirements" on page 30
- "Supported operating systems" on page 31

- "Supported software" on page 31

After planning the VCS features that you want to configure, you must prepare to configure these features. Figure 2-6 represents the major tasks and decisions required to install and configure VCS.

Figure 2-6 Workflow for fresh install of VCS 5.0



Complete the following preparatory tasks based on the VCS features you want to configure:

- "Installing root broker for Symantec Product Authentication Service" on page 34
- "Creating encrypted files for Symantec Product Authentication Service" on page 35
- "Installing the management server for the Veritas Cluster Management Console" on page 37

Hardware requirements

Make sure that you meet the following requirements.

Table 2-1 Hardware requirements for a cluster

Item	Description
VCS systems	From 1 to 32 IBM systems running AIX 5.2 or 5.3.
DVD drive	One drive in a system that can communicate to all the nodes in the cluster.
Disks	Typical VCS configurations require that shared disks support applications that migrate between systems in the cluster. The VCS I/O fencing feature requires that all disks used as data disks or as coordinator disks must support SCSI-3 Persistent Reservations (PR). The coordinator disk does not store data, so configure the disk as the smallest possible LUN on a disk array to avoid wasting space. See "Setting up I/O fencing" on page 119.
Disk space	To run VCS, LLT, GAB, the Web Console, and the Java Console, each VCS system requires the following file system space (each block is 1024 bytes); ■ 600 MB in /opt ■ 21 MB in /usr ■ 580 MB in /var If you do not have enough free space in /var, then use the `installvcs` command with `tmppath` option. Make sure that the specified tmppath file system has the required free space. ■ 2 MB in /
Ethernet controllers	In addition to the built-in public Ethernet controller, VCS requires at least one more Ethernet interface per system. Symantec recommends two additional interfaces.

Table 2-1 Hardware requirements for a cluster

Item	Description
Fibre Channel or SCSI host bus adapters	Typical VCS configuration requires at least one SCSI or Fibre Channel Host Bus Adapter per system for shared data disks.
RAM	Each VCS system requires at least 256 megabytes.

Supported operating systems

Run VCS 5.0 on these operating systems at the suggested patch levels.

- AIX 5.2 ML6 (legacy) or later
- AIX 5.3 TL4 with SP4
  SP 4 was not available at the time of this release. Veritas 5.0 products also operate on AIX 5.3 with Service Pack 3, but you must install an AIX interim fix. See the following TechNote for information on downloads, service pack availability, and other important issues related to this release.
  http://support.veritas.com/docs/282024

Supported software

- Logical Volume Manager (LVM)
- Journaled File System (JFS) and Enhanced Journaled File System (JFS2) on LVM
- VxVM 4.0 with VxFS 4.0
- VxVM 5.0 with VxFS 5.0

Note: If you plan to set up VCS I/O fencing in a shared storage environment, Symantec recommends using VxVM versions 4.1 or 5.0.

Supported software for the Veritas Cluster Management Console

You can install the Cluster Management Console on a standalone system to manage multiple clusters or you can install the console on cluster nodes to manage a local cluster.

When you set up a management server to manage multiple clusters, you can connect to the clusters directly or install the cluster connector on cluster nodes to enable connection across firewalls.

Install Mode	Supported software
Multi-cluster mode To manage multiple clusters. Installed on a standalone system designated the *management server*.	■ Solaris 8, 9, and 10, with patches indicated by Sun ■ Windows 2000 Server, Advanced Server, and Datacenter, with SP4 or patches as indicated by Microsoft ■ Windows Server 2003 Standard Edition, Datacenter Edition, Enterprise Edition, and Web Edition, with patches as indicated by Microsoft **Note:** Windows Management Instrumentation (WMI) must be installed on Windows 2003 systems prior to installing Cluster Management Console.
Single cluster mode To manage a single cluster. Installed on cluster nodes.	Install Cluster Management Console in this mode only with VCS 5.0 in a fresh installation or upgrade scenario.

Install Mode	Supported software
Cluster Connector Installed on cluster nodes to enable a management server to manage a cluster across a firewall	AIX ■ VCS versions: 4.0, 4.0 MP1, 4.0 MP2, 4.0 MP3, and 5.0 ■ OS versions: AIX 5.2 ML6 (legacy) or later; AIX 5.3 TL4 with SP 3 **Note:** Cluster connector installations are not supported on clusters running AIX 5.1. Use direct connection to manage clusters running AIX 5.1. HP-UX ■ VCS versions: 4.1 and 5.0 ■ OS versions: HP-UX 11i v2 Linux ■ VCS versions: 4.0, 4.0 MP1, 4.0 MP2, 4.1, 4.1 MP1, 4.1 MP2, and 5.0 ■ OS versions: RHEL 4 Update 3, SLES 9. **Note:** Cluster connector installations are not supported on clusters running RHEL 3.0. Use direct connection to manage clusters running RHEL 3.0. Solaris ■ VCS versions: 4.0, 4.0 MP1, 4.0 MP2, 4.1, 4.1 MP1, and 5.0 ■ OS versions: 8, 9, and 10 **Note:** Cluster connector installations are not supported on clusters running Solaris 7. Use direct connection to manage clusters running Solaris 7. Windows ■ VCS versions: 4.1, 4.2, 4.2 RP1, 4.2 RP2, 4.3, 4.3 MP1 ■ OS versions: Windows 2000 Server, Advanced Server, and Datacenter, with SP4 or patches as indicated by ■ Microsoft. Windows Server 2003* Standard Edition, Datacenter Edition, Enterprise Edition, and Web Edition, with patches as indicated by Microsoft * Windows Management Instrumentation (WMI) must be installed on Windows 2003 systems prior to installing Cluster Management Console.

Supported browsers for the Cluster Management Console

Veritas Cluster Management Console is supported on the following browsers:

- Microsoft Internet Explorer 6.0 or later
- Firefox 1.5 or later

Veritas Cluster Management requires the Macromedia Flash Plugin v8.0.

Installing root broker for Symantec Product Authentication Service

Install the root broker only if you plan on using Symantec Product Authentication Service. The root broker administrator must install and configure the root broker before you configure the Authentication Service for VCS. Symantec recommends that you install the root broker on a stable system that is outside the cluster. You can install the root broker on an AIX, HP-UX, Linux, or Solaris system. See *Veritas Cluster Server User's Guide* for more information. You can configure the Authentication Service during or after VCS installation.

See "Symantec Product Authentication Service" on page 22.

To install the root broker

1. Change to the directory where you can start the installvcs program:
   ```
   # cd cluster_server
   ```
2. Start the Root Broker installation program:
   ```
   # ./installvcs -security
   ```
3. Select to install the Root Broker from the three choices that the installer presents:
   ```
   3 Install Symantec Security Services Root Broker
   ```
4. Enter the name of the system where you want to install the Root Broker.
   ```
   Enter the system name on which to install VxSS: east
   ```
5. Review the output as the installer:
   - checks to make sure that the VCS supports the operating system
   - verifies that you are installing from the global zone (only on Solaris)
   - checks if the system already runs the security fileset
6. Review the output as the installvcs program checks for the installed filesets on the system.
   The installvcs program lists the filesets that will be installed on the system. Press Enter to continue.
7. Review the output as the installer installs the root broker on the system.

8 Enter **y** when the installer prompts you to configure the Symantec Product Authentication Service.

9 Enter a password for the root broker. Make sure the password contains a minimum of five characters.

10 Enter a password for the authentication broker. Make sure the password contains a minimum of five characters.

11 Press Enter to start the Authentication Server processes.

```
Do you want to start Symantec Product Authentication Service
processes now? [y,n,q] y
```

12 Review the output as the installer starts the Authentication Service.

13 If you plan to configure the Authentication Service during VCS installation, choose to configure the cluster in secure mode when the installer prompts you.

See "Installing and configuring VCS 5.0" on page 60.

Creating encrypted files for Symantec Product Authentication Service

Create encrypted files only if you plan on choosing the semiautomatic mode that uses an encrypted file to configure the Authentication Service. The encrypted files must be created by the administrator on the root broker node. The administrator must create encrypted files for each node that would be a part of the cluster before you configure the Authentication Service for VCS. See *Veritas Cluster Server User's Guide* for more information. You can configure the Authentication Service during or after VCS installation.

See "Symantec Product Authentication Service" on page 22.

To create encrypted files

1 Determine the root broker domain name. Enter the following command on the root broker system:

```
east> # vssat showalltrustedcreds
```

For example, the domain name would resemble
"Domain Name: root@east.symantecexample.com" in the output.

2 For each node in the cluster, make sure that you have created an account on root broker system.

For example, to verify on node north:

```
east> # vssat showprpl --pdrtype root \
--domain root@east.symantecexample.com --prplname north
```

- If the output displays the principal account on root broker for the authentication broker on the node, then delete the existing principal accounts. For example:

  ```
  east> # vssat deleteprpl --pdrtype root \
  --domain root@east.symantecexample.com \
  --prplname north --silent
  ```

- If the output displays an error similar to "Failed To Get Attributes For Principal," then the account for given authentication broker is not created on this root broker. Proceed to step 3.

3 Create a principal account for each authentication broker in the cluster. For example:

```
east> # vssat addprpl --pdrtype root --domain \
root@east.symantecexample.com --prplname north \
--password password --prpltype service
```

You must use this password that you create in the input file for the encrypted file.

4 Make a note of the following information that is required for the input file for the encrypted file.

- hash - The root hash string that consists of 40 characters, as shown by the command:

  ```
  east> # vssat showbrokerhash
  ```

- identity - Authentication broker identity

  The value that you provide for **--prplname** in step 3 (for example, north).

- password - Authentication broker password

  The value that you provide for **--password** in step 3.

- root_domain - Domain name of the root broker system

  The value that you determined in step 1.

- broker_admin_password - Authentication broker password for Administrator account on the node

  Provide a password of at least five characters long.

5 For each node in the cluster, create the input file for the encrypted file.

The installer presents the format of the input file for the encrypted file when you proceed to configure the Authentication Service using encrypted file. For example, the input file for authentication broker on north would resemble:

```
[setuptrust]
broker=east.symantecexample.com
hash=758a33dbd6fae751630058ace3dedb54e562fe98
securitylevel=high

[configab]
```

```
identity=north
password=password
root_domain=vx:root@east.symantecexample.com
root_broker=east.symantecexample.com:2821
broker_admin_password=ab_admin_password
start_broker=true
enable_pbx=false
```

6 Back up these input files that you created for the authentication broker on each node in the cluster.

Note that for security purposes, the command to create the output file for the encrypted file deletes the input file.

7 For each node in the cluster, create the output file for the encrypted file from the root broker system using the following command.

```
RootBroker> # vssat createpkg --in /path/to/blob/input/file.txt
--out /path/to/encrypted/blob/file.txt --host_ctx AB-hostname
```

For example:

```
east> # vssat createpkg --in /tmp/north.blob.in \
--out /tmp/north.blob.out --host_ctx north
```

Note that this command creates a encrypted file even if you provide wrong password for “password=” entry, but the encrypted file will fail to install on authentication broker node.

8 After you complete creating output files for the encrypted file, you must copy these files to the installer node.

9 If you plan to configure the Authentication Service during VCS installation, choose to configure the cluster in secure mode when the installer prompts you.

See “Installing and configuring VCS 5.0” on page 60.

Installing the management server for the Veritas Cluster Management Console

Install the Cluster Management Console management server only if you plan to centrally manage multiple clusters. Make sure you have a root broker in your domain. VCS clusters need not be secure to configure Cluster Management Console to manage multiple clusters.

See “Veritas Cluster Management Console” on page 25.

Install the Cluster Management Console management server and supporting components on a standalone system (outside any cluster but on the local network). Configure the management server to use a previously installed root broker or install and configure a root broker on the management server host.

You can install the management server on one of the following supported operating systems:

- Installing the management server on Solaris
- Installing the management server on Windows 2003 systems

Installing the management server on Solaris

You must install the management server on a system outside the cluster. This procedure follows a script of a successful installation. If at any step you experience a result other than the expected result that is documented here, you can click “n” to re-enter information. If you continue to have problems, click “q” to quit the installation and then verify the installation prerequisites.

To install the management server on Solaris

1. Insert the distribution media into the disc drive on the local system. At the command prompt, type the following command to run the setup program:
   ```
   ./installer -rsh
   ```
   The setup program (setup) presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2. Enter **i** to specify a task.
   ```
   Enter a Task: [I,C,L,P,U,D,Q,?] i
   ```
   Setup displays another menu that lists products that are available for installation.

3. Select the menu number that corresponds to Veritas Cluster Management Console.
   ```
   Select a product to install: [1-13,b,q]
   ```
   Setup presents a description of the product.

4. Enter 1 to select a product component.
   ```
   Enter '1' to install the Management Server, '2' to install the
   Cluster
   Connector: [1-2,q] (1) 1
   ```
   Setup presents a message stating that it will install the management server.

5. Enter **y** to verify that the information up to this point is correct.
   ```
   Is this information correct? [y,n,q] (y)
   ```
   Setup performs an initial system check of the local system and checks for installed packages on the local system. If these checks are satisfactory, setup lists the packages to be installed.
   ```
   Storage Foundation and High Availability Solutions 5.0
   installer will install the following CMC packages:
   VRTSat       Symantec Product Authentication Service
   VRTSperl     Veritas Perl 5.8.8 Redistribution
   VRTSdbms3    Symantec Shared DBMS
   ```

```
VRTSjre15    Veritas Java Runtime Environment Redistribution
VRTSweb      Veritas Java Web Server
VRTScmcm     Veritas Cluster Management Console
VRTScmcdc    Veritas Cluster Management Console Documentation
Press [Return] to continue:
```

6 Press Enter.

You may install Cluster Management Console packages without performing configuration. The setup program gives you the option to configure Cluster Management Console now, and provides instructions for configuring Cluster Management Console later.

7 Enter **y** to configure Cluster Management Console.

```
Are you ready to configure CMC? [y,n,q] (y)
```

8 Enter a unique management server display name, such as:

```
Enter a unique management server display name: [?]
mgmtserver1_sol9
```

9 Enter the network address used by the management server, such as:

```
Enter the network address used by the management server [b,?]
mgmtserver1.symantec.com
```

10 When prompted, enter a location for the management server database.

```
Enter the desired location of the database to be used by the
management server [b,?] (/opt/VRTScmc/db)
```

Setup repeats the management server display name, the management server network address, and the database location.

11 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q,b] (y)
```

Setup describes local user configuration and custom user configuration.

12 Configure a local user or a custom user as the initial management server administrator. This is the first user account that is enabled to log in to the Cluster Management Console.

Make your selection and then specify the following user authentication details:

- For a local user, setup assumes that the domain name is the name of the local system and that the domain type is unixpwd, or UNIX password. When prompted for the initial management server user name, enter root or another administrator-level user for the local system.
- For a custom user, you must explicitly specify the domain name and the domain type along with the user name. Follow the three separate prompts to enter this user information.

```
Local User:
Configure a user on the local machine as the initial admin user.
Custom User:
Configure a user manually.
```

```
1)  Local User
2)  Custom User
Enter '1' to enter the name of a local user, '2' to set up a
custom user:
[1-2,q] (1) 1
Storage Foundation and High Availability Solutions 5.0
Local admin user selection:
To log in to the CMC Management Server, enter the name of a local
user to be set as the administrator. The domain and domain type
will be automatically selected for you.
Enter the initial management server user name: [b,?] (root)
Storage Foundation and High Availability Solutions 5.0
Management Server admin user verification:
Management Server User Name: root
```

13 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q,b] (y)
```

Setup describes a particular management server service account, which the management server uses for secure internal communications with cluster connector. This account is named CMC_CC@CMC_SERVICES.

14 Enter a password for the management server service account and confirm it at the next prompt.

```
Enter a password for the CMC service account:xxxxx
Confirm the password you entered for the CMC service
account:xxxxx
```

When you install and configure cluster connector, you must provide this same password for the CMC_CC@CMC_SERVICES account.

15 Specify whether or not you want the management server to use a remote root broker for user authentication.

If you have already configured a root broker in your network, Symantec recommends that you enter **y** to use that existing root. Specify the additional details for that remote root broker exactly as specified.

If you do not have a currently-configured root broker, enter **n** to install and configure a root broker on the management server host.

After you enter **y** or **n**, setup installs an authentication broker on the management server and configures it to use whichever root broker you selected. When finished, setup presents:

- Installation progress percentages
- Status for writing the management server configuration file
- Status for creating secure internal service accounts

16 Enter **y** to start Veritas Cluster Management Console processes now.

```
Do you want to start Veritas Cluster Management Console
processes now? [y,n,q,b] (y)
```

Setup presents startup progress percentages and, if successful, displays the following message:

```
Startup completed successfully on all systems.
```

17 Enter an encryption key of at least five characters.

```
Enter five or more characters to be used an encryption key: [b]
xxxxx
This key must be retained in a secure file and referenced using
the -enckeyfile option if the generated responsefile is to be
used again.
Press [Return] to continue:
```

18 Press Enter to continue.

Record the location that setup provides for the installation log files, summary file, and response file. Also ensure that you record the initial admin user information. You *must* use this account to log in to the Cluster Management Console for the first time.

Installing the management server on Windows 2003 systems

You must install the management server on a system outside all clusters. Windows Management Instrumentation (WMI) is a prerequisite for installing and using the management server and cluster connector.

To install WMI

1 Log on as a user that has administrator privileges on the system on which you want to install WMI.

2 On the **Start** menu, click **Settings**, and then click **Control Panel.**

3 In the Control Panel window, double-click **Add or Remove Programs**.

4 In the task pane, click **Add/Remove Windows Components**.

5 Click **Management and Monitoring Tools**, then click **Details**.

6 Ensure that the WMI Windows Installer Provider is checked, and then click **OK**.

7 Click **Next**.

8 If prompted, insert the Windows disc and click **OK**.

9 After installation is complete, click **Finish**.

10 Restart your computer.

To install the management server on Windows

1 On the distribution disc, locate the **\installer** directory.

2 Double-click the **setup** file.
Depending upon the operating system, you may or may not receive the following warning message:
```
The publisher could not be verified. Are you sure you want to
run this software?
```
If you receive this message, click **Run**.

3 In the Welcome to the Veritas Cluster Management Console Installation Manager dialog box, read the introduction and then click **Next**.

4 In the Installation and Configuration Options dialog box, click **Install a new management server on the local node**, and then click **Next**.

5 In the Management Server Installation Directory dialog box, leave the default installation path provided in the text box or click **Browse** to search for another installation location. Click **Next** to accept the path.

6 In the Management Server Information dialog box, enter the system name and IP address of the intended management server host.
You cannot change the port specification, 14145, but it is provided to help you to prevent port conflicts when configuring other software. The other ports used by the Cluster Management Console are 8181 (HTTP), 8443 (HTTPS), and 2994 (DBMS; this port can be shared with other Symantec products)

7 In the Database File Path box, leave the default database path provided or click **Browse** to search for another location for the database. Click **Next** to accept the path.

8 In the Services Account Password dialog box, enter a password for the user account that cluster connector uses for management server communications, and then click **Next**.
Record the password that you enter in a safe place. You must use it again whenever you install or configure cluster connector.

9 In the User Credential Confirmation dialog box, leave the automatically-detected user information provided or specify another user name, domain, and domain type.
This user becomes the initial management server user. You must provide the credentials entered at this step when logging in to the management server for the first time.

10 In the Summary dialog box, review the information you have specified and, if satisfactory, click **Next** to accept it and start the installation.
The Installing Veritas Cluster Management Console dialog box displays a progress bar and a status message window for the installation.

11 When you receive the following message, click **Next**:
`"Done deleting installation files from node...,"`

12 In the Completed the Symantec Veritas Cluster Management Console Installation Manager dialog box, review the information about how to connect to the management server and log in for the first time. Record this information in a safe place and then click **Finish**.

The installer creates log files at the following locations:

- Installation logs – `C:\Documents and Settings\All Users\Application Data\VERITAS\Cluster Management Console`. The file names are Install_GUI_0.log and Install_MSI_0.log.
- Management server logs – `C:\Program Files\VERITAS\Cluster Management Console\log`

Copying the VCS installation guide and release notes to each node

After you install the management server, copy the Install Guide and the Release Notes over to the management server. The documentation locations on the distribution disc are:

- Install Guide
  cluster_server/docs/vcs_install.pdf
- Release Notes
  cluster_server/release_notes/vcs_notes.pdf

Accessing Cluster Management Console information

Information about administering clusters in multi-cluster mode is available in the Veritas Cluster Server Centralized Management Guide. The online help includes information about administering clusters in both single-cluster and multi-cluster mode. If you want to access the information about managing a single cluster in printed documentation, you can install the documentation package to the desired system.

The documentation package name for each supported operating system is:

- AIX—VRTSvcs.doc
- HP-UX—VRTSvcsdc
  Note that you can copy the documents from depot/VRTSvcsdc/VRTSvcsdc/opt/VRTS/docs.
- Linux—VRTSvcsdc
- Solaris—VRTSvcsdc

Performing pre-installation tasks

Table 2-2 lists the tasks you must perform before proceeding to install VCS.

Table 2-2 Pre-installation tasks

Task	Reference
Set the PATH and MANPATH variables.	"Setting the PATH variable" on page 44 "Setting the MANPATH variable" on page 45
Set up the private network.	"Setting up the private network" on page 45
Set up shared storage for I/O fencing (optional)	"Setting up shared storage" on page 46
Enable communication between systems.	"Enabling communication between systems" on page 48
Review basic instructions to optimize LLT media speeds.	"Optimizing LLT media speed settings on private NICs" on page 48
Review guidelines to help you set the LLT interconnects.	"Guidelines for setting the media speed of the LLT interconnects" on page 48
Set up `ssh` on cluster systems.	"Setting up ssh on cluster systems" on page 49
Obtain license keys.	"Obtaining VCS license keys" on page 50
Mount the product disc	"Mounting the product disc" on page 51

Setting the PATH variable

Installation commands as well as other commands reside in the `/sbin`, `/usr/sbin`, `/opt/VRTS/bin`, and `/opt/VRTSvcs/bin` directories. Add these directories to your PATH environment variable.

To set the PATH variable

- Do one of the following:
  - For the Bourne Shell (sh or ksh), type:

```
$ PATH=/usr/sbin:/sbin:/opt/VRTS/bin:/opt/VRTSvcs/bin:\
$PATH; export PATH
```

- For the C Shell (csh or tcsh), type:

```
% setenv PATH /usr/sbin:/sbin:/opt/VRTS/bin:\
/opt/VRTSvcs/bin:$PATH
```

Setting the MANPATH variable

To set the MANPATH variable

- Do one of the following:
  - For the Bourne Shell (sh or ksh), type:

```
$ MANPATH=/usr/share/man:/opt/VRTS/man; export MANPATH
```

  - For the C Shell (csh or tcsh), type:

```
% setenv MANPATH /usr/share/man:/opt/VRTS/man
```

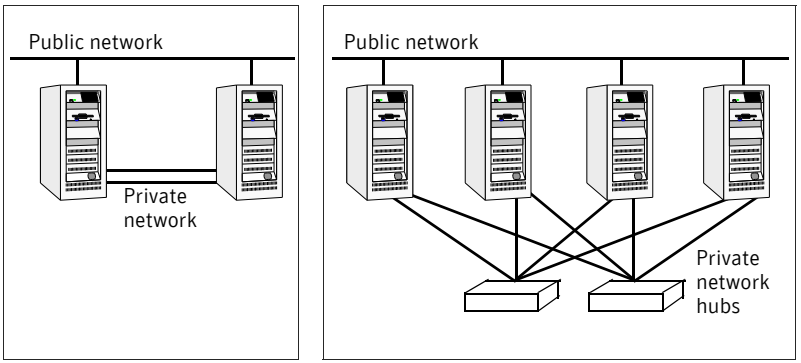
Setting up the private network

VCS requires you to setup a private network between the systems that will form part of a cluster.

To set up the private network

1. Install the required network interface cards (NICs).
2. Connect the VCS private Ethernet controllers on each system.
3. Use cross-over Ethernet cables (supported only on two systems), or independent hubs, for each VCS communication network. Ensure that power to the hubs comes from separate sources. On each system, use two independent network cards to provide redundancy.
   During the process of setting up heartbeat connections, note that a chance for data corruption exists if a failure removes all communications between the systems and still leaves the systems running and capable of accessing shared storage.

Figure 2-7 Private network setups: two-node and four-node clusters



4 Test network connections by temporarily assigning network addresses and use `telnet` or `ping` to verify communications.
LLT uses its own protocol, and does not use TCP/IP. Therefore, to ensure the private network connections are used only for LLT communication and not for TCP/IP traffic, unplumb and unconfigure the temporary addresses after testing.
The installvcs program configures the private network in the cluster during installation.
See "Installing and configuring VCS" on page 57.

Using network switches

You can use network switches instead of hubs.

Setting up shared storage

The following sections describe setting up SCSI and Fibre Channel devices that the cluster systems share. For VCS I/O fencing, the data disks must support SCSI-3 persistent reservations. You need to configure a coordinator disk group that supports SCSI-3 PR and verify that it works.

See "Setting up I/O fencing" on page 119.

See also the *Veritas Cluster Server User's Guide* for a description of I/O fencing.

Setting the SCSI identifier value

Typically, AIX SCSI adapters are set with a default identifier value of 7. Each device on a SCSI bus must have a unique SCSI identifier value. Therefore, when more than one system is connected to a SCSI bus, the SCSI identifier must be changed on one or more systems to a unique number, typically 5 or 6.

Perform the steps below if you are connecting to shared storage with shared SCSI devices.

1 Determine the SCSI adapters on each system:

```
north # lsdev -C -c adapter | grep scsi
scsi0   Available 11-08    Wide/Ultra-2 SCSI I/O Controller
scsi1   Available 11-09    Wide/Ultra-2 SCSI I/O Controller
south # lsdev -C -c adapter | grep scsi
scsi0   Available 11-08    Wide/Ultra-2 SCSI I/O Controller
scsi1   Available 11-09    Wide/Ultra-2 SCSI I/O Controller
```

2 Verify the SCSI ID of each adapter:

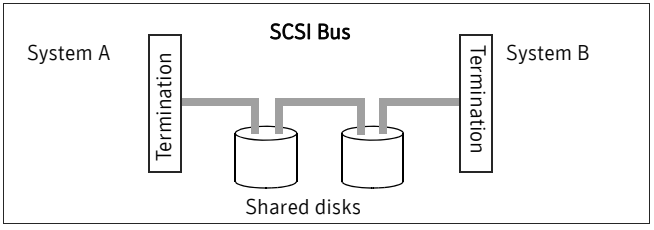
```
north # lsattr -E -l scsi0 -a id
id 7 Adapter card SCSI ID True
north # lsattr -E -l scsi1 -a id
id 7 Adapter card SCSI ID True
south # lsattr -E -l scsi0 -a id
id 7 Adapter card SCSI ID True
south # lsattr -E -l scsi1 -a id
id 7 Adapter card SCSI ID True
```

3 If necessary, change the SCSI identifier on each system so that it is unique:

```
south # chdev -P -l scsi0 -a id=5
scsi0 changed
south # chdev -P -l scsi1 -a id=5
scsi1 changed
```

4 Shut down all systems in the cluster.

5 Cable the shared storage as illustrated in the example below:



6 Restart each system. Once all systems have booted, use the `lspv` command to verify that each system can see all shared devices needed by the application.

Setting up Fibre Channel

To set up fibre channel

1. Connect the Fibre Channel adapters and the shared storage devices to the same hub or switch. If a fibre switch is being used, be sure that zoning, if implemented, does not prevent all systems from seeing all shared devices required to run the critical application.
2. Reboot each system:
   ```
   ok shutdown -Fr
   ```
3. Once all systems have booted, use the `lspv` command to verify that each system can see all shared devices needed by the application.

Enabling communication between systems

When you install VCS using the installvcs program, to install and configure the entire cluster at one time, make sure that communication between systems exists. By default the installer uses `ssh`. You must grant permissions for the system where you run installvcs program to issue `ssh` or `rsh` commands as root on all systems in the cluster. If `ssh` is used to communicate between systems, it must be configured in a way such that it operates without requests for passwords or passphrases. Similarly, `rsh` must be configured in such a way to not prompt for passwords.

If system communication is not possible between systems using `ssh` or `rsh`, you have recourse.

See “Performing VCS installation in a secure environment” on page 88.

See “Manually installing and configuring VCS” on page 107.

Optimizing LLT media speed settings on private NICs

For optimal LLT communication among the cluster nodes, the interface cards on each node must use the same media speed settings. Also, the settings for switches or hubs used for the interconnects must match that of the interface cards. Incorrect settings can cause poor network performance or even network failure.

Guidelines for setting the media speed of the LLT interconnects

If you have hubs or switches for LLT interconnects, Symantec recommends using the Auto_Negotiation media speed setting on each Ethernet card on each node.

If you have hubs or switches for LLT interconnects and you do not use the Auto_Negotiation media speed setting, set the hub or switch port to the same setting as that used on the cards on each node.

If you use directly connected Ethernet links (using crossover cables), set the media speed to the highest value common to both cards, typically 100_Full_Duplex.

Symantec does not recommend using dissimilar network cards for private links.

Details for setting the media speeds for specific devices are outside of the scope of this manual. Consult the device's documentation for more information.

Setting up ssh on cluster systems

Use the Secure Shell (`ssh`) to install VCS on all systems in a cluster from a system outside of the cluster. Verify that `ssh` is configured correctly before starting the installation process.

Secure Shell (`ssh`) is a program to log on to another computer over a network, to execute commands on a remote system, and to copy files from one system to another. The `ssh` provides strong authentication and secure communications over channels. It is intended to replace `rlogin`, `rsh`, and `rcp`.

Configuring ssh

The procedure to configure `ssh` uses OpenSSH example file names and commands.

To configure ssh

1. Log on to the system from which you want to install VCS.
2. Generate a DSA key pair on this system by running the following command:
   `# ssh-keygen -t dsa`
3. Accept the default location of ~/.ssh/id_dsa.
4. When prompted, enter a passphrase and confirm it.
5. Change the permissions of the .ssh directory by typing:
   `# chmod 755 ~/.ssh`
6. The file ~/.ssh/id_dsa.pub contains a line beginning with ssh_dss and ending with the name of the system on which it was created. Copy this line to the /root/.ssh/authorized_keys2 file on all systems where VCS is to be installed.
   If the local system is part of the cluster, make sure to edit the authorized_keys2 file on that system.

7 Run the following commands on the system from which the installation is taking place:

```
# exec /usr/bin/ssh-agent $SHELL
# ssh-add
```

This step is shell-specific and is valid for the duration the shell is alive.

8 When prompted, enter your DSA passphrase.

You are ready to install VCS on several systems by running the installvcs program on any one of them or on an independent system outside the cluster.

9 To verify that you can connect to the systems on which VCS is to be installed, type:

```
# ssh -x -l root north ls
# ssh -x -l root south ifconfig
```

The commands should execute on the remote system without having to enter a passphrase or password.

Note: You can configure `ssh` in other ways. Regardless of how `ssh` is configured, complete the last step in the example above to verify the configuration.

Obtaining VCS license keys

This product includes a License Key certificate. The certificate specifies the product keys and the number of product licenses purchased. A single key lets you install the product on the number and type of systems for which you purchased the license. A key may enable the operation of more products than are specified on the certificate; however, you are legally limited to the number of product licenses purchased.

The product installation procedure describes how to activate the key. If you encounter problems while licensing this product, visit the Symantec licensing support website at:

http://www.veritas.com/buy/vLicense/vLicenseHome.jhtml

The VRTSvlic package enables product licensing. After the VRTSvlic is installed, the following commands and their manual pages are available on the system:

vxlicinst	Installs a license key for a Symantec product
vxlicrep	Displays currently installed licenses
vxlictest	Retrieves features and their descriptions encoded in a license key

Even though other products are included on the enclosed software discs, you can only install the Symantec software products for which you have purchased a license.

Mounting the product disc

You must have superuser (`root`) privileges to load the VCS software.

To mount the product disc

1. Log in as superuser on a system connected by the network to the systems where you are installing VCS. The system that you are using to install VCS need not be part of the cluster.
2. Determine the device access name of the disc drive. For example, enter:

   ```
   # lsdev -C -c cdrom
   ```

   The output might resemble:

   ```
   cd0 Available 1G-19-00 IDE DVD-ROM Drive
   ```

   In this example, `cd0` is the disc's device access name.
3. Make sure the /cdrom file system is created:

   ```
   # cat /etc/filesystems
   ```

   - If the /cdrom file system exists, the output contains a listing that resembles:

     ```
     .
     .
     /cdrom:
     dev = /dev/cd0
     vfs = cdrfs
     mount = false
     options = ro
     account = false
     .
     .
     ```
4. If the /cdrom file system does not exist, create it:

   ```
   # crfs -v cdrfs -p ro -d cd0 -m /cdrom
   ```
5. Insert the product disc with the VCS software into a drive connected to the system.
6. Mount the disc:

   ```
   # mount /cdrom
   # cd /cdrom
   ```

Getting your VCS installation and configuration information ready

The VCS installation and configuration program prompts you for information about certain VCS components. When you perform the installation, prepare the following information.

- To install VCS filesets you need:

The system names where you plan to install VCS	Example: **`north`**, **`south`**
The required license keys	Keys include: ■ A valid site license key ■ A valid demo license key ■ A valid license key for VCS global clusters See "Obtaining VCS license keys" on page 50.
To decide whether to install: ■ the required VCS filesets ■ all the VCS filesets	Install only the required filesets if you do not want to configure any optional components or features. The default option is to install all filesets. See "Optional VCS filesets" on page 56.

- To configure the Veritas Cluster Server you need:

The name of the cluster	The cluster name must begin with a letter of the alphabet. The cluster name can contain only the characters "a" through "z", "A" through "Z", the numbers "0" through "9", the hyphen "-", and the underscore "_". Example: **`vcs_cluster27`**
A unique ID number for the cluster	A number in the range of 0-65535. Within the site that contains the cluster, each cluster must have a unique ID. Example: **`7`**
The device names of the NICs used by the private networks among systems	Do not use the network interface card that is used for the public network, which is typically en0. Example: **`en2, en3`**

- To configure VCS clusters in secure mode (optional), you need:

For automatic mode (default)	■ The name of the Root Broker system Example: **east** See "Symantec Product Authentication Service" on page 22. ■ Access to the Root Broker system without use of a password.
For semiautomatic mode using encrypted files	The path for the encrypted files that you get from the Root Broker administrator. See "Creating encrypted files for Symantec Product Authentication Service" on page 35.
For semiautomatic mode without using encrypted files	■ The fully-qualified hostname (FQDN) of the Root Broker . (e.g. east.symantecexample.com) The above example given posits a system in the (DNS) domain symantecexample.com with the unqualified hostname east, which is designated as the Root Broker. ■ The root broker's security domain (e.g. root@east.symantecexample.com) ■ The root broker's port (e.g. 2821) ■ The path to the local root hash (e.g. /var/tmp/privatedir/root_hash) ■ The authentication broker's principal name on the each cluster node (e.g. north.symantecexample.com and south.symantecexample.com)

- To add VCS users, which is not required if you configure your cluster in secure mode, you need:

User names	Example: **smith**
User passwords	Enter the password at the prompt.
To decide user privileges	Users have three levels of privileges: A=Administrator, O=Operator, or G=Guest. Example: **A**

- To configure the Cluster Management Console to locally manage this cluster (optional), you need:

The name of the public NIC for each node in the cluster	The device name for the NIC that provides public network access. Example: **en0**
A virtual IP address of the NIC for the Cluster Management Console	This virtual IP address becomes a resource for use by the ClusterService group that includes the Cluster Management Console. The "Cluster Virtual IP address" can fail over to another cluster system, making the Web Console highly available. Example: **10.10.12.1**
The netmask for the virtual IP address	The subnet used with the virtual address. Example: **255.255.240.0**

- To configure the Cluster Management Console cluster connector (optional), you need:

The management server network address for Cluster Management Console	The Cluster Management Console cluster connector requires the management server network address. See "Veritas Cluster Management Console" on page 25. Example: **mgmtserver1.symantecexample.com**
A Cluster Management Console service account password	You must have set this account password while installing the management server.
The root hash of the management server	You can use `vssat showbrokerhash` command and copy the root hash of the management server.

- To configure SMTP email notification (optional), you need:

The domain-based address of the SMTP server	The SMTP server sends notification emails about the events within the cluster. Example: **smtp.symantecexample.com**
The email address of each SMTP recipient to be notified	Example: **john@symantecexample.com**

To decide the minimum severity of events for SMTP email notification	Events have four levels of severity: I=Information, W=Warning, E=Error, and S=SevereError. Example: **E**

- To configure SNMP trap notification (optional), you need:

The port number for the SNMP trap daemon	The default port number is 162.
The system name for each SNMP console	Example: **saturn**
To decide the minimum severity of events for SNMP trap notification	Events have four levels of severity: I=Information, W=Warning, E=Error, and S=SevereError. Example: **E**

- To configure global clusters (optional), you need:

The name of the public NIC	You can use the same NIC that you configured for the ClusterService group. Otherwise, specify appropriate values for the NIC. Example: **en0**
The virtual IP address of the NIC	You can use the same virtual IP address that you configured for the ClusterService group. Otherwise, specify appropriate values for the virtual IP address. Example: **10.10.12.1**
The netmask for the virtual IP address	You can use the same netmask as configured for the ClusterService group. Otherwise, specify appropriate values for the netmask. Example: **255.255.240.0**

- To configure I/O fencing:

The names of the three disks that form the coordinator disk group	Example: **rhdisk75, rhdisk76, rhdisk77**
The DMP nodes names for each disk in the coordinator disk group (if using DMP)	Example: **/dev/vx/dmp**

Optional VCS filesets

The optional VCS filesets include:

- VRTScmccc — Veritas Cluster Management Console Cluster Connector
- VRTScmcs — Veritas Cluster Management Console
- VRTScssim — VCS Simulator
- VRTScscm — Veritas Cluster Server Cluster Manager
- VRTSvcs.doc - VCS documentation
- VRTSvcs.man - Manual pages for VCS commands

Chapter 3

Installing and configuring VCS

This chapter contains the following topics:

About installing and configuring VCS

You can install Veritas Cluster Server on clusters of up to 32 systems. You can install VCS using one of the following:

Veritas product installer	Offers a high-level approach to installing multiple Veritas products.

installvcs program	Offers a direct approach to installing VCS.

The Veritas product installer and the installvcs program use `ssh` to install by default. See the *Getting Started Guide* for more information.

About the VCS installation program

You can access the installvcs program from the command line or through the Veritas product installer. The VCS installation program is interactive and manages the following tasks:

- Licensing VCS
- Installing VCS filesets on multiple cluster systems
- Configuring VCS, creating several detailed configuration files on each system
- Starting VCS processes

You can choose to configure the optional: Web-based Cluster Management Console, SNMP and SMTP notification features in the cluster, Symantec Product Authentication Services feature, or the wide area Global Cluster feature. Review the highlights of the information for which installvcs program prompts you as you proceed to configure.

See “Preparing to install and configure VCS” on page 21.

The uninstallvcs program, a companion to installvcs program, uninstalls VCS filesets.

See “About the uninstallvcs program” on page 100.

Optional features of the installvcs program

Table 3-3 specifies the optional actions that the installvcs program can perform.

Table 3-3 installvcs optional features

Optional action	Reference
Check the systems to verify that they meet the requirements to install VCS.	See “Checking the systems for installation” on page 61.
Upgrade VCS to version 5.0 if VCS currently runs on a cluster.	“Upgrading VCS using installvcs program” on page 165
Install VCS filesets without configuring VCS.	See “Installing VCS using installonly option” on page 87.

Table 3-3 installvcs optional features

Optional action	Reference
Configure or reconfigure VCS when VCS filesets are already installed.	See "Configuring VCS using configure option" on page 88.
Perform secure installations using values stored in a configuration file.	See "Performing VCS installation in a secure environment" on page 88.
Perform automated installations using values stored in a configuration file.	See "Performing automated installations" on page 89.

Interacting with the installvcs program

As you run the program, you are prompted to answer "yes or no" questions that are typically followed by a set of responses resembling **[y, n, q, ?] (y)**. The response within parentheses is the default, which you can select by pressing Return. Enter the **?** character to get help to answer the prompt. Enter **q** to quit the installation.

Note: Installation of VCS filesets takes place only after you have confirmed the information. However, you must remove the partially installed VCS files before running the installvcs program again.
See "Uninstalling VCS 5.0" on page 100.

At some points during the installation, the installer prompts you to type information and expects your responses to be within a certain range or in a specific format. The installer provides examples. If you are prompted to enter an item from a list, enter your selection exactly as it is shown in the list.

When the installer prompts you to answer a series of questions related to a configuration activity, you can enter the **b** character to return to the first prompt in the series. When the installer displays a set of information items you have entered, you are prompted to confirm it. If you answer **n**, the program lets you re-enter all of the information for the set.

You can install the VCS Java Console on a single system, which is not required to be part of the cluster.

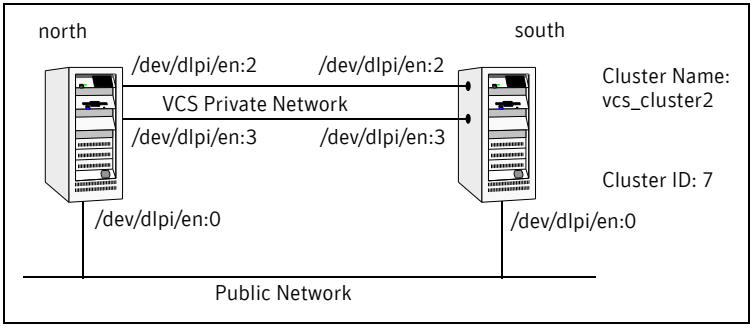
See "Installing the VCS Java Console" on page 76.

Installing and configuring VCS 5.0

Figure 3-8 illustrates the systems on which you would install and run VCS. The example installation demonstrates how to install VCS on two systems: north and south. The example installation chooses to install all VCS filesets and configures all optional features. For this example, the cluster's name is vcs_cluster2 and the cluster's ID is 7.

See "Sample VCS installation and configuration output" on page 217.

Figure 3-8 An example of a VCS installation on a two-node cluster



Overview of tasks

Table 3-4 lists the installation and configuration tasks.

Table 3-4 Installation and configuration tasks

Task	Reference
Start the installation process and choose the installation	■ "Checking the systems for installation" on page 61 (optional) ■ "Starting the software installation" on page 62 ■ "Specifying systems for installation" on page 63 ■ "Licensing VCS" on page 63 ■ "Choosing VCS filesets" on page 64 ■ "Choosing to install VCS filesets or configure VCS" on page 65

Table 3-4 Installation and configuration tasks

Task	Reference
Configure the cluster and optional features	■ "Configuring the cluster" on page 65 ■ "Configuring the cluster in secure mode" on page 66 (optional) ■ "Adding VCS users" on page 68 (optional) ■ "Configuring cluster connector" on page 68 (optional) ■ "Configuring the Cluster Management Console" on page 69 (optional) ■ "Configuring SMTP email notification" on page 70 (optional) ■ "Configuring SNMP trap notification" on page 72 (optional) ■ "Configuring global clusters" on page 73 (optional)
Install the filesets and create configuration files	■ "Installing the VCS filesets" on page 74 ■ "Creating VCS configuration files" on page 74
Start VCS and its components	■ "Starting VCS" on page 75 ■ "Completing the installation" on page 75
Perform the post-installation tasks	■ "Copying the installation guide to each node" on page 75 ■ "Setting up I/O fencing" on page 76 ■ "Installing the VCS Java Console" on page 76 ■ "Establishing cluster communication with the management server" on page 77 ■ "Installing cluster connector" on page 78
Verify the cluster	■ "Verifying the cluster after installation" on page 87

Checking the systems for installation

Before beginning the installation of VCS software, you can check the readiness of the systems where you plan to install VCS. The command to start the pre-installation check is:

```
installvcs -precheck system1 system2 ...
```

To check the systems

1. Navigate to the folder containing the installvcs program.
   # **cd /cdrom/cluster_server**
2. Start the pre-installation check:
   # **./installvcs -precheck north south**
   The program proceeds in a non-interactive mode, examining the systems for licenses, filesets, disk space, and system-to-system communications.
3. Review the output as the program displays the results of the check and saves the results of the check in a log file.
   See "About installvcs command options" on page 97.

Starting the software installation

You can install VCS using the Veritas product installer or the installvcs program.

To install VCS using the product installer

1. Confirm that you are logged in as the superuser and mounted the product disc.
2. Start the installer.
   # **./installer**
   The installer starts the product installation program with a copyright message and specifies the directory where the logs are created.
3. From the opening Selection Menu, choose: "**I**" for "Install/Upgrade a Product."
4. From the displayed list of products to install, choose: **Veritas Cluster Server**.

To install VCS using the installvcs program

1. Confirm that you are logged in as the superuser and mounted the product disc.
2. Navigate to the folder containing the installvcs program.
   # **cd /cluster_server**
3. Start the installvcs program.
   # **./installvcs**
   The installer begins with a copyright message and specifies the directory where the logs are created.

Specifying systems for installation

The installer prompts for the system names on which you want to install and then performs an initial system check.

To specify system names for installation

1. Enter the names of the systems where you want to install VCS.

   ```
   Enter the system names separated by spaces on which to install
   VCS: north south
   ```

   For a single node installation, enter one name for the system.

   See "Starting the installer for the single node cluster" on page 194.

2. Review the output as the installer verifies the systems you specify.

   The installer does the following:

   - Checks that the local node running the installer can communicate with remote nodes

     If the installer finds `ssh` binaries, it confirms that `ssh` can operate without requests for passwords or passphrases.
   - Makes sure the systems use the proper operating system
   - Checks whether a previous version of VCS is installed

     If a previous version of VCS is installed, the installer provides an option to upgrade to VCS 5.0.

     See "Upgrading VCS using installvcs program" on page 165.

Licensing VCS

The installer checks whether VCS license keys are currently in place on each system. If license keys are not installed, the installer prompts you for the license keys.

See "Checking licensing information on the system" on page 96.

To license VCS

1. Review the output as the utility checks system licensing and installs the licensing fileset.
2. Enter the license key for Veritas Cluster Server as the installer prompts for each node.

   ```
   Enter a VCS license key for north: [?) XXXX-XXXX-XXXX-XXXX-XXX
   XXXX-XXXX-XXXX-XXXX-XXX successfully registered on north
   VCS license registered on north
   ```

3 Enter keys for additional product features.

```
Do you want to enter another license key for north? [y,n,q,?]
(n) y

Enter a VCS license key for north: [?] XXXX-XXXX-XXXX-XXXX-XXX
XXXX-XXXX-XXXX-XXXX-XXX successfully registered on north

Do you want to enter another license key for north? [y,n,q,?]
(n)
```

4 Review the output as the installer registers the license key on the other nodes. Enter keys for additional product features on the other nodes when the installer prompts you.

```
XXXX-XXXX-XXXX-XXXX-XXX successfully registered on south
VCS license registered on south

Do you want to enter another license key for south? [y,n,q,?]
(n)
```

Choosing VCS filesets

The installer verifies for any previously installed filesets and then based on your choice installs all the VCS filesets or only the required filesets.

To install VCS filesets

1 Review the output as the installer checks the filesets that are already installed.

2 Choose the VCS filesets to be installed.

```
Select the filesets to be installed on all systems? [1-3,q,?]
(3) 2
```

Based on what filesets you want to install, enter one of the following:

1	Installs only the required VCS filesets.
2	Installs all the VCS filesets. You must choose this option to configure any optional VCS feature. Note that this option is the default if you already installed the SF HA filesets.
3	Installs all the VCS and SF HA filesets. (default option) If you already installed the SF HA filesets, the installer does not list this option.

3 View the list of filesets that the installer would install on each node.
If the current version of a fileset is on a system, the installer removes it from the fileset installation list for the system.

Choosing to install VCS filesets or configure VCS

While you must configure VCS before you can use VCS, you can do one of the following:

- Choose to install and configure VCS now.
  See "Configuring the cluster" on page 65.
- Install filesets on the systems and leave the cluster configuration steps for later.

To install VCS filesets now and configure VCS later

1. If you do not want to configure VCS now, enter **n** at the prompt.

   ```
   Are you ready to configure VCS? [y,n,q] (y) n
   ```

   The utility checks for the required file system space and makes sure that any processes that are running do not conflict with the installation.

   If requirements for installation are not met, the utility stops and indicates the actions required to proceed with the process.
2. Review the output as the installer uninstalls any previous versions and installs the VCS 5.0 filesets.
3. Configure the cluster later.

   See "Configuring VCS using configure option" on page 88.

Configuring the cluster

The installer provides you an option to configure VCS and its optional features.

Note: You can use `installvcs -configure` command to configure the cluster later and enter the system names where you want to configure VCS when the installer prompts you.

To configure the cluster

1. Enter **y** or press **Enter** at the prompt to configure VCS.

   ```
   It is optional to configure VCS now. If you choose to configure
   VCS later, you can either do so manually or run the
   installvcs -configure command.
   Are you ready to configure VCS?
   [y,n,q] (y) y
   ```
2. Review the configuration requirements that the installer lists.
3. Enter the unique cluster name and cluster ID.

   ```
   Enter the unique cluster name: [?] vcs_cluster2
   Enter the unique Cluster ID number between 0-65535: [b,?] 7
   ```

4 Review the NICs available on the first system as the installer discovers and reports them.

5 Enter the details for the private heartbeat links.

You must not enter the network interface card that is used for the public network (typically en0.)

```
Enter the NIC for the first private heartbeat NIC on north:
[b,?] en2
Would you like to configure a second private heartbeat link?
[y,n,q,b,?] (y)
Enter the NIC for the second private heartbeat NIC on north:
[b,?] en3
Would you like to configure a third private heartbeat link?
[y,n,q,b,?](n)
Do you want to configure an additional low priority heartbeat
link? [y,n,q,b,?] (n)
```

6 Choose whether to use the same NICs on all nodes.

- If you want to use the same NICs for private heartbeat links on all nodes, make sure the same NICs are available on each system and enter **y**.
- Enter **n** to use NICs with different device names on some of the nodes.

```
Are you using the same NICs for private heartbeat links on all
systems? [y,n,q,b,?] (y)
```

7 Verify and confirm the information that the installer summarizes.

Configuring the cluster in secure mode

Before you configure a cluster in a secure mode, make sure to meet the requirements for automatic or semiautomatic mode of configuration. You can also enable Symantec Product Authentication Service later.

See "Symantec Product Authentication Service" on page 22.

To configure the cluster in secure mode

1 Choose whether to configure VCS to use Symantec Product Authentication Service.

```
Would you like to configure VCS to use Symantec Security
Services? [y,n,q] (n) y
```

- If you want to configure the cluster in secure mode, make sure you have installed the root broker and enter **y**.
- If you do not want to configure the cluster in secure mode and want to proceed to adding VCS users, enter **n**.

  See "Adding VCS users" on page 68.

2 Select one of the options to enable security.

```
Select the Security option you would like to perform [1-3,q,?]
```

Based on the mode of configuration you want to use, enter one of the following:

Option	Tasks
1. Automatic configuration	Enter the name of the Root Broker system when prompted. Requires remote access to the Root Broker. Review the output as the installer verifies communication with the Root Broker system, checks vxatd process and version, and checks security domain.
2 . Semi-automatic using encrypted files	Enter the path of the file for each node when prompted.

3. Semi-automatic entering authentication information at installer prompts	Enter the following Root Broker information as the installer prompts you:
	`Enter root Broker name:`
	`east.symantecexample.com`
	`Enter root broker FQDN: [b]`
	`(symantecexample.com)` **`symantecexample.com`**
	`Enter root broker domain: [b]`
	`(root@east.symantecexample.com)`
	`root@east.symantecexample.com`
	`Enter root broker port: [b] (2821)` **`2821`**
	`Enter path to the locally accessible root hash [b] (/var/tmp/installvcs-1Lcljr/root_hash)`
	`/root/root_hash`
	Enter the following Authentication Broker information as the installer prompts you for each node:
	`Enter authentication broker principal name on north [b]`
	`(north.symantecexample.com)`
	`north.symantecexample.com`
	`Enter authentication broker password on north:`
	`Enter authentication broker principal name on south [b]`
	`(south.symantecexample.com)`
	`south.symantecexample.com`
	`Enter authentication broker password on south:`

3 After configuring the cluster in secure mode, proceed to configure the Cluster Management Console cluster connector.

See "Configuring cluster connector" on page 68.

Adding VCS users

If you have enabled Symantec Product Authentication Service, you do not need to add VCS users now.

Proceed to configure the Cluster Management Console cluster connector. Otherwise, on systems operating under an English locale, you can add VCS users at this time.

See "Configuring the cluster in secure mode" on page 66.

See "Configuring cluster connector" on page 68.

To add VCS users

1. Review the required information to add VCS users.
2. Reset the password for the Admin user, if necessary.

```
Do you want to set the password for the Admin user
(default password='password')? [y,n,q] (n) y

Enter New Password:******

Enter Again:******
```

3. To add a user, enter **y** at the prompt.

```
Do you want to add another user to the cluster? [y,n,q] (y)
```

4. Enter the user's name, password, and level of privileges.

```
Enter the user name: [?] smith
Enter New Password:*******

Enter Again:*******
Enter the privilege for user smith (A=Administrator, O=Operator,
G=Guest): [?] a
```

5. Enter **n** at the prompt if you have finished adding users.

```
Would you like to add another user? [y,n,q] (n)
```

6. Review the summary of the newly added users and confirm the information.

Configuring cluster connector

If you configured the Cluster Management Console management server to centrally manage this cluster, you can now configure cluster connector for the buffering feature. If a firewall exists between the management server and this cluster, then you must configure cluster connector to enable centralized management. Make sure you meet the prerequisites to configure cluster connector.

See "Veritas Cluster Management Console" on page 25.

To configure cluster connector

1. Review the information to configure Cluster Management Console.
2. Choose whether to configure cluster connector or not. Do one of the following:
   - To configure cluster connector on the systems, press Enter.
     ```
     Do you want this cluster to be managed by a management
     server? Enter 'y' if you have set up a management server.
     [y,n,q] (y) y
     ```
   - To skip configuring cluster connector and advance to configuring Cluster Management Console for local cluster management, enter **n**.
     See "Configuring the Cluster Management Console" on page 69.
3. Review the required information to configure cluster connector.
4. Enter the management server network address for the Cluster Management Console.
   ```
   Enter the network address used by the management server [?]
   (north) mgmtserver1.symantecexample.com
   ```
5. Verify and confirm the management server information.
6. Enter the following information that is required to securely communicate with the management server.
   - Password for the service account that is created during the management server installation
   - Hash of the Cluster Management Console management server's root broker
7. Verify and confirm the information.

Configuring the Cluster Management Console

If you want to locally manage this cluster, then you must configure the Cluster Management Console. Note that this cluster can also be a part of the clusters that are centrally managed by the management server.

See "Veritas Cluster Management Console" on page 25.

To configure the Cluster Management Console

1. Review the required information to configure the Cluster Management Console.
2. Choose whether to configure the Cluster Management Console or not. Do one of the following:
   - To configure the Cluster Management Console on the systems, press **Enter**.

```
Do you want to configure the Cluster Management Console
[y,n,q](y)
```

- To skip configuring the Cluster Management Console and advance to configuring SMTP, enter **n**.
  See "Configuring SMTP email notification" on page 70.

3 Confirm whether you want to use the discovered public NIC on the first system. Do one of the following:

- If the discovered NIC is the one to use, press **Enter**.
- If you want to use a different NIC, type the name of a NIC to use and press **Enter**.

```
Active NIC devices discovered on north: en0
Enter the NIC for Cluster Management Console to use on north:
[b,?](en0)
```

4 Confirm whether you want to use the same public NIC on all nodes. Do one of the following:

- If all nodes use the same public NIC, enter **y**.
- If unique NICs are used, enter **n** and enter a NIC for each node.

```
Is en0 to be the public NIC used by all systems [y,n,q,b,?] (y)
```

5 Enter the virtual IP address for the Cluster Management Console.

```
Enter the Virtual IP address for Cluster Management Console:
[b,?] 10.10.12.1
```

6 Confirm the default netmask or enter another one:

```
Enter the netmask for IP 10.10.12.1: [b,?] (255.255.240.0)
```

7 Verify and confirm the Cluster Management Console information.

```
Cluster Management Console verification:

    NIC: en0
    IP: 10.10.12.1
    Netmask: 255.255.240.0

Is this information correct? [y,n,q] (y)
```

Configuring SMTP email notification

You can choose to configure VCS to send event notifications to SMTP e-mail services. You need to provide the SMTP server name and e-mail addresses of people to be notified. Note that it is also possible to configure notification after installation. Refer to the *Veritas Cluster Server User's Guide* for more information.

To configure SMTP email notification

1 Review the required information to configure the SMTP email notification.

2 Specify whether you want to configure the SMTP notification. Do one of the following:

- To configure SMTP notification, press **Enter**.

  ```
  Do you want to configure SMTP notification? [y,n,q] (y) y
  ```

- To skip configuring SMTP notification and advance to configuring SNMP notification, enter **n**.

  See "Configuring SNMP trap notification" on page 72.

3 Provide information to configure SMTP notification.

- Enter the SMTP server's host name.

  ```
  Enter the domain-based hostname of the SMTP server
  (example: smtp.yourcompany.com): [b,?] smtp.example.com
  ```

- Enter the email address of each recipient.

  ```
  Enter the full email address of the SMTP recipient
  (example: user@yourcompany.com): [b,?] ozzie@example.com
  ```

- Enter the minimum security level of messages to be sent to each recipient.

  ```
  Enter the minimum severity of events for which mail should be
  sent to ozzie@example.com  [I=Information, W=Warning,
  E=Error, S=SevereError]: [b,?] w
  ```

4 Add more SMTP recipients, if necessary.

- If you want to add another SMTP recipient, enter **y** and provide the required information at the prompt.

  ```
  Would you like to add another SMTP recipient? [y,n,q,b] (n) y

  Enter the full email address of the SMTP recipient
  (example: user@yourcompany.com): [b,?] harriet@example.com

  Enter the minimum severity of events for which mail should be
  sent to harriet@example.com  [I=Information, W=Warning,
  E=Error, S=SevereError]: [b,?] E
  ```

- If you do not want to add, answer **n**.

  ```
  Would you like to add another SMTP recipient? [y,n,q,b] (n)
  ```

5 Verify and confirm the SMTP notification information.

```
SMTP Address: smtp.example.com
Recipient: ozzie@example.com receives email for Warning or
higher events
Recipient: harriet@example.com receives email for Error or
higher events

Is this information correct? [y,n,q] (y)
```

Configuring SNMP trap notification

You can choose to configure VCS to send event notifications to SNMP management consoles. You need to provide the SNMP management console name to be notified and message severity levels. Note that it is also possible to configure notification after installation. Refer to the *Veritas Cluster Server User's Guide* for more information.

To configure the SNMP trap notification

1. Review the required information to configure the SNMP notification feature of VCS.
2. Specify whether you want to configure the SNMP notification. Do one of the following:
   - To configure SNMP notification, press **Enter**.
     ```
     Do you want to configure SNMP notification? [y,n,q] (y)
     ```
   - To skip configuring SNMP notification and advance to configuring global clustering option, enter **n**.
     See "Configuring global clusters" on page 73.
3. Provide information to configure SNMP trap notification.
   - Enter the SNMP trap daemon port.
     ```
     Enter the SNMP trap daemon port: [b,?] (162)
     ```
   - Enter the SNMP console system name.
     ```
     Enter the SNMP console system name: [b,?] saturn
     ```
   - Enter the minimum security level of messages to be sent to each console.
     ```
     Enter the minimum severity of events for which SNMP traps
     should be sent to saturn [I=Information, W=Warning, E=Error,
     S=SevereError]: [b,?] E
     ```
4. Add more SNMP consoles, if necessary.
   - If you want to add another SNMP console, enter **y** and provide the required information at the prompt.
     ```
     Would you like to add another SNMP console? [y,n,q,b] (n) y
     Enter the SNMP console system name: [b,?] jupiter
     Enter the minimum severity of events for which SNMP traps
     should be sent to jupiter [I=Information, W=Warning,
     E=Error, S=SevereError]: [b,?] S
     ```
   - If you do not want to add, answer **n**.
     ```
     Would you like to add another SNMP console? [y,n,q,b] (n)
     ```

5 Verify and confirm the SNMP notification information.

```
SNMP Port: 162
Console: saturn receives SNMP traps for Error or
higher events
Console: jupiter receives SNMP traps for SevereError or
higher events

Is this information correct? [y,n,q] (y)
```

Configuring global clusters

You can configure global clusters to link clusters at separate locations and enable wide-area failover and disaster recovery. Note that you must have entered a valid license key for VCS global clusters.

To configure the global cluster option

1 Review the required information to configure the global cluster option.

2 Specify whether you want to configure the global cluster option. Do one of the following:

- To configure global cluster option, press **Enter**.

  ```
  Do you want to configure the Global Cluster Option? [y,n,q]
  (y)
  ```

- To skip configuring global cluster option and advance to installing VCS filesets, enter **n**.

  See "Installing the VCS filesets" on page 74.

3 Provide information to configure the Global Cluster option.

If you configured Cluster Management Console to manage this cluster locally, the installer discovers and displays the virtual IP address and netmask used by the Cluster Management Console. You can use the same virtual IP address and netmask.

See "Configuring the Cluster Management Console" on page 69.

Do one of the following:

- If you want to use the default values, press **Enter**.
- If you do not want to use the default value, enter another IP address.

  The installer prompts you for a NIC and value for the netmask.

  ```
  Enter the Virtual IP address for Global Cluster Option:
  [b,?] (10.10.12.1)
  ```

4 Verify and confirm the configuration of the global cluster.

```
Global Cluster Option configuration verification:

NIC: en0
IP: 10.10.12.1
Netmask: 255.255.240.0

Matching Cluster Management Console Virtual IP configuration

Is this information correct? [y,n,q] (y)
```

Installing the VCS filesets

After the installer gathers all the configuration information, the installer installs the filesets on the cluster systems. If you already installed the filesets and chose to configure or reconfigure the cluster, the installer proceeds to create the configuration files.

See "Creating VCS configuration files" on page 74.

The utility checks for the required file system space and makes sure that any processes that are running do not conflict with the installation. If requirements for installation are not met, the utility stops and indicates the actions required to proceed with the process. Review the output as the installer uninstalls any previous versions and installs the VCS 5.0 filesets.

Creating VCS configuration files

After installing the filesets, the installer continues to create configuration files and copies them to each system:

```
Creating Cluster Server configuration files ..... Done
Copying configuration files to north..... Done
Copying configuration files to south..... Done

Cluster Server configured successfully.
```

If you chose to configure the cluster in secure mode, the installer also configures the Symantec Product Authentication Service. Depending on the mode you chose to set up Authentication Service, the installer creates security principal or executes the encrypted file to create security principal on each node in the cluster. The installer creates the VxSS service group, creates Authentication Server credentials on each node in the cluster, and Web credentials for VCS users, and sets up trust with the root broker. Then, the installer proceeds to start VCS in secure mode.

Starting VCS

You can now start VCS and its components on each system. If you chose to configure the cluster in secure mode, the installer also starts the Authentication Service processes on each node in the cluster.

To start VCS

- Confirm to start VCS and its components on each node.

```
Do you want to start Veritas Cluster Server processes now?
[y,n,q] (y) y
```

Completing the installation

After VCS 5.0 installation completes successfully, the installer creates summary, log, and response files. The files provide useful information that can assist you with the installation and can also assist future installations. Table 3-5 specifies the files created at the end of the installation.

Review the location of the installation log files, summary file, and response file that the installer displays.

Table 3-5 File description

File	Description
summary file	■ Lists filesets installed on each system. ■ Describes the cluster and its configured resources. ■ Provides information for managing the cluster.
log file	Details the entire installation.
response file	Contains configuration information that can be used to perform secure or unattended installations on other systems. See “Example response file” on page 90.

Note: The installer applies some software and does not commit. The system administrator must commit the software later using the `installp -c` command.

Copying the installation guide to each node

After you install VCS, Symantec recommends that you copy the PDF version of this guide from the installation disc (cluster_server/docs/vcs_install.pdf) to the directory /opt/VRTS/docs on each node to make it available for reference.

Setting up I/O fencing

Symantec recommends you to set up the I/O fencing feature to prevent data corruption in the event of a communication breakdown in the cluster. Make sure that you do the following before you set up I/O fencing:

- Install a version of Veritas Volume Manager (VxVM) that supports SCSI-3 persistent reservations.
- Verify that the disks you intend to use for shared data storage and for coordinator disks support SCSI-3 PR (Persistent Reservations).

See "Setting up I/O fencing" on page 119.

Installing the VCS Java Console

You can administer VCS using the VCS Java-based graphical user interface, Java Console. After VCS has been installed, install the Java Console on a Windows NT, Windows 2000 Professional system, Windows XP, or Windows 2003 system, or AIX system with X-Windows. The system from which you run the Java Console can be a system in the cluster or a remote workstation; the latter enables each system in the cluster to be administered remotely.

For information about using the Cluster Manager and the Configuration Editor components of the Java Console, see the applicable chapter in the *Veritas Cluster Server User's Guide*.

Installing the Java Console on AIX

To install Java console on AIX

1. Log in as superuser on the node where you intend to install the fileset.
2. Create a directory for the installation of the VCS 5.0 Java Console:
   ```
   # mkdir /tmp/install
   ```
3. Determine the device access name of the disc drive. For example, enter:
   ```
   # lsdev -C -c cdrom
   ```
   The output might resemble:
   ```
   cd0 Available 1G-19-00 IDE DVD-ROM Drive
   ```
   In this example, `cd0` is the disc's device access name.
4. Insert the software disc with the VCS software into a drive connected to the system.
5. Mount the disc using the device access name found in step 3:
   ```
   # mkdir -p /cdrom
   # mount -V cdrfs -o ro /dev/cd0 /cdrom
   # cd /cdrom
   ```

6 Copy the compressed files from the software disc to the temporary directory:

```
# cp -r cluster_server/pkgs/VRTScscm.rte.gz /tmp/install
```

7 If your system does not have the `gunzip` utility, copy from the disc:

```
# cp /cdrom_path/gnu/gunzip /tmp/install
```

8 Go to the temporary directory and unzip the compressed package file:

```
# cd /tmp/install
# gunzip VRTScscm.rte.gz
```

The following file is now present in the temporary directory:

```
VRTScscm.rte.bff
```

9 Install the fileset using the following command:

```
# installp -a -d VRTScscm.rte.bff VRTScscm.rte
```

10 Answer "y" if prompted.

Installing the Java Console on a Windows system

You can install the VCS Java Console (Cluster Manager) on a Windows NT, Windows 2000 Professional, Windows XP, or Windows 2003 system to administer the cluster.

To install the Java Console on a Windows system

1 Insert the software disc with the VCS software into a drive on your Windows system.

2 Using Windows Explorer, select the disc drive.

3 Go to \windows\VCSWindowsInstallers\ClusterManager.

4 Open the language folder of your choice, for example EN.

5 Double-click setup.exe.

6 The Veritas Cluster Manager Install Wizard guides you through the installation process.

Establishing cluster communication with the management server

Use the following list to prepare clusters for administration and management through the Cluster Management Console.

- Ensure that all clusters that you want to manage run a supported version of VCS.

  "Supported software for the Veritas Cluster Management Console" on page 31.

- Decide which clusters are to use cluster connector to communicate with the management server, and then install cluster connector on each cluster.
  Cluster connector is a process agent. You must use cluster connector if a firewall exists between the management server and any clusters. You can install cluster connector when you install VCS 5.0.
  For other VCS versions, you must install cluster connector on each cluster node to establish a connection to the management server. Only certain versions of VCS can connect to the management server.
  See "Installing cluster connector" on page 78.
- Decide which clusters are to use a direct connection to communicate with the management server. If these clusters run a supported version of VCS, they require no further preparation.
  Refer to the *Veritas Cluster Server Centralized Management Guide* for more information on direct connection.

After you prepare the clusters for management server administration, start the Cluster Management Console and use it to configure the management server to connect to clusters using direct connection. Clusters using cluster connector connect to the management server automatically.

Refer to the *Veritas Cluster Server Centralized Management Guide* for more information on cluster connector.

Installing cluster connector

Cluster connector is a process agent, which you must use if a firewall exists between the management server and any clusters. You can install cluster connector on UNIX-based or Windows-based clusters. You can also use a batch feature to install cluster connector on UNIX-based clusters.

Note: You must stop all VCS Web consoles, VCS Java consoles, and agent wizards that are running on any cluster nodes before you install cluster connector.

For all cluster connector installations, cluster connector installs or upgrades Symantec Product Authentication Service (version 4.3) on target systems that do not already have it.

For Windows, you must install the authentication broker on the local system (the system from which you run the cluster connector installation). You can install cluster connector from the management server or from any other system that runs the authentication broker. For UNIX, one of the following two conditions must be true:

- You are installing cluster connector (locally or remotely) from a system running the authentication broker.

- You are installing cluster connector (locally or remotely) from a cluster node and that cluster node is in your install list.

  For example, assume that you have nodes A, B, and C each in their own cluster; each have the authentication broker installed. You also have system X with no authentication broker. You cannot install cluster connector from X. You can install cluster connector from A to B and C to other nodes.

Installing the cluster connector on UNIX systems

Perform this procedure to use cluster connector for management server communications when the cluster is a supported VCS cluster. You can also use this procedure if you want to install or configure cluster connector after installing VCS 5.0 on a cluster.

To install cluster connector on a UNIX system

1. Insert the distribution disc into the drive on the local system. At the command prompt, type the following command to run the installer program:

   ```
   ./installer -rsh
   ```

   The installer program presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2. Enter **i** to specify a task.

   ```
   Enter a Task: [I,C,L,P,U,D,Q,?] i
   ```

   The installer displays another menu that lists products that are available for installation.

3. Enter the menu number that corresponds to **Veritas Cluster Management Console**.

   ```
   Select a product to install:nn
   ```

   The installer presents a description of the product.

4. Enter **2** if you are prompted to select a product component.

   ```
   Enter '1' to install the Management Server, '2' to install the
   Cluster Connector: [1-2,q] (1) 2
   ```

   The installer presents a message stating that it will install cluster connector. Note that option 1 only appears on Solaris systems.

5. Enter the name of one system in each cluster to be managed. Separate the system names with spaces.

   ```
   Storage Foundation and High Availability Solutions 5.0
   Enter the name of a system in each cluster that you want the
   management server to manage. Separate system names with spaces:
   system1 system2 system3
   ```

   The installer detects the systems that you enter, performs an initial check of those systems, and then checks for installed packages on those systems.

If these checks are satisfactory, the installer lists the packages to be installed.

6 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

The installer performs an initial system check of the local system and checks for installed packages on the local system. If these checks are satisfactory, the installer program lists the packages to be installed.

```
Storage Foundation and High Availability Solutions 5.0
installer will install the following CMC packages:
VRTSat       Symantec Product Authentication Service
VRTSperl     Veritas Perl 5.8.8 Redistribution
VRTSjre15    Veritas Java Runtime Environment Redistribution
VRTScmccc    Veritas Cluster Management Console Cluster
Connector
Press [Return] to continue:
```

7 Press Enter.

You may install Cluster Management Console packages without performing configuration. The installer program gives you the option to configure Cluster Management Console now, and provides instructions for configuring Cluster Management Console later.

8 Enter **y** to configure Cluster Management Console.

```
Are you ready to configure CMC? [y,n,q] (y)
```

9 Enter the fully-qualified management server network address, such as:

```
Enter the network address used by the management server [?]
mgmtserver1.symantec.com
```

10 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

11 Enter a password for the cluster connector service account.

The password is the password that was entered for the cluster connector service account during management server installation.

```
Enter the password for the CMC service account:xxxxx
```

12 Enter the root hash of the authentication broker installed on the management server, which you can get from the Root Broker administrator.

```
Enter the hash of the Management Server's root broker [?]
```

- On Windows:

  \program files\veritas\security\authentication\bin\vssat showbrokerhash

- On UNIX systems:

  /opt/VRTSat/bin/vssat showbrokerhash

The output of this command looks similar to the following:

```
Root Hash:      9dfde3d9aaebee084f8e35819c1fed7e6b01d2ae
```

Enter the alphanumeric string (the string you receive is different from the one shown).

13 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

The installer presents:

- Installation progress percentages
- Authentication status messages
- Cluster connector configuration status messages

14 Enter **y** to start Veritas Cluster Management Console processes.

```
Do you want to start Veritas Cluster Management Console
processes now?
[y,n,q] (y)
```

The installer presents startup progress percentages and, if successful, displays the following message:

```
Startup completed successfully on all systems
```

15 Enter an encryption key of at least five characters.

This key is used to encrypt passwords in the response file. It must be referred to using the `-enckeyfile` option if the generated installation response file is to be used again.

```
A string of five or more characters is required to encrypt
passwords in the responsefile
Enter five or more characters to be used an encryption key:
xxxxx
Press [Return] to continue:
```

16 Press Enter.

Record the location that the installer program provides for the installation log files, summary file, and response file.

Batch installation of cluster connector on UNIX systems

This process is available for a new installation on supported UNIX clusters and for the upgrade of UNIX clusters running CommandCentral Availability cluster monitor.

To perform a batch installation of cluster connector on UNIX

1 Insert the distribution disc into the drive on the local system. At the command prompt, type the following command to run the installer program:

```
./installer -rsh
```

The installer program presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2 Enter **i** to specify a task.

```
Enter a Task: [I,C,L,P,U,D,Q,?] i
```

The installer displays another menu that lists products that are available for installation.

3 Enter the menu number that corresponds to Veritas Cluster Management Console.

```
Select a product to install:nn
```

The installer presents a description of the product. The installer may also display the prompt:

4 Enter **2** if you are prompted to select a product component.

The installer presents a message stating that it will install cluster connector.

```
Enter '1' to install the Management Server, '2' to install the
Cluster Connector: [1-2,q] (1)
```

5 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

The installer performs an initial system check of the local system and checks for installed packages on the local system. If these checks are satisfactory, the installer program lists the packages to be installed.

```
Storage Foundation and High Availability Solutions 5.0
installer will install the following CMC packages:
VRTSat       Symantec Product Authentication Service
VRTSperl     Veritas Perl 5.8.8 Redistribution
VRTSjre15    Veritas Java Runtime Environment Redistribution
VRTScmccc    Veritas Cluster Management Console Cluster
Connector
Press [Return] to continue:
```

6 Enter the name of one system in each cluster to be managed. Separate the system names with spaces.

```
Storage Foundation and High Availability Solutions 5.0
Enter the name of a system in each cluster that you want the
management server to manage. Separate system names with spaces:
system1 system2 system3
```

The installer detects the systems that you enter, performs an initial check of those systems, and then checks for installed packages on those systems. If these checks are satisfactory, the installer lists the packages to be installed.

```
Storage Foundation and High Availability Solutions 5.0
The following CMC packages will be installed:
VRTSat       Symantec Product Authentication Service
VRTSperl     Veritas Perl 5.8.8 Redistribution
VRTSjre15    Veritas Java Runtime Environment Redistribution
```

```
VRTScmccc    Veritas Cluster Management Console cluster
connector
Press [Return] to continue:
```

7 Press Enter.

You may install Cluster Management Console packages without performing configuration. The installer program gives you the option to configure Cluster Management Console now and provides instructions for configuring Cluster Management Console later.

8 Enter **y** to configure Cluster Management Console.

```
Are you ready to configure CMC? [y,n,q] (y)
```

9 Enter the fully-qualified management server network address.

```
Enter the network address used by the management server [?]
mgmtserver1.symantec.com
```

The installation program repeats the management server address.

10 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

11 Enter a password for the cluster connector service account.

The password is the password that was entered for the cluster connector service account during management server installation.

```
Enter the password for the CMC service account:xxxxx
```

12 Enter the root hash of the authentication broker installed on the management server.

```
Enter the hash of the Management Server's root broker [?]
```

To retrieve the root hash of the management server authentication broker, run the following command:

- On Windows:

  \program files\veritas\security\authentication\bin\vssat showbrokerhash

- On UNIX systems:

  /opt/VRTSat/bin/vssat showbrokerhash

The output of this command looks similar to the following:

```
Root Hash:      9dfde3d9aaebee084f8e35819c1fed7e6b01d2ae
```

Enter the alphanumeric string (the string you receive is different from the one shown).

13 Enter **y** when prompted to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

The installer presents:

- Installation progress percentages
- Authentication status messages
- Cluster connector configuration status messages

14 Enter **y** to start Veritas Cluster Management Console processes now.

```
Do you want to start Veritas Cluster Management Console
processes now?
[y,n,q] (y)
```

The installer program presents startup progress percentages and, if successful, displays the following message:

```
Startup completed successfully on all systems
```

15 Enter an encryption key of at least five characters.

This key is used to encrypt passwords in the response file. It must be referred to using the `-enckeyfile` option if the generated installation response file is to be used again.

```
A string of five or more characters is required to encrypt
passwords in the responsefile
Enter five or more characters to be used an encryption key:
xxxxx
Press [Return] to continue:
```

16 Press Enter.

Record the location that the installer program provides for the installation log files, summary file, and response file.

Installing cluster connector on Windows platforms

Cluster Management Console can manage VCS clusters that run on Windows. You can manage these clusters using cluster connector or direct connect just like the UNIX clusters.

Note: When installing cluster connector on 64-bit Windows platforms from a 32-bit system, the default install directory will show up as c:\Program Files. Symantec recommends that you change the 64-bit installation directory to C:\Program Files (x86).

To install cluster connector on Windows

1 Insert the distribution disc into the DVD drive on the local system.

2 On the distribution disc, locate the locate the \installer directory under \windows\cluster management console directory.

3 Double-click the setup.bat file.

Depending upon the operating system, you may or may not receive the following warning message:

```
The publisher could not be verified. Are you sure you want to
run this software?
```

If you receive this message, click **Run**.

4 In the Welcome to the Veritas Cluster Management Console Installation Manager dialog box, read the introduction and then click **Next**.

5 In the Installation and Configuration Options dialog box, click **Add Clusters or clustered systems to a management server**, and then click **Next**.

6 In the Cluster Connector Cluster Selection dialog box, follow the dialog box instructions exactly as specified, and then click **Next**.

The installer performs a check for WMI on the specified nodes to ensure that they are ready for cluster connector installation.

7 When prompted, enter user account information for each cluster. If a cluster is secure, you are prompted for a domain name in addition to a user name and password that is valid for the cluster.

8 In the Cluster Connector Directory Selection dialog box, do one of the following:

- Leave the default directories provided
- Click a directory and then click **Select** to specify another directory
- Click **Reset** all to specify new directories on each node

Click **Next** to accept the directories.

9 In the Management Server Information dialog box, provide the IP address for the management server to which cluster connector is intended to connect.

You cannot change the port specification, 14145, but it is provided to help you to prevent port conflicts when configuring other software. The other ports used by the Cluster Management Console are 8181 (HTTP), 8443 (HTTPS), and 2994 (DBMS; this port can be shared with other Symantec products)

10 In the Services Account Password dialog box:

- Enter a password for the user account that cluster connector uses for management server communications
- Enter the root hash of the authentication broker used by the authentication broker installed on the management server

The password is the password that was entered for the cluster connector service account during management server installation.

To retrieve the root hash of the management server authentication broker, run the following command:

- On Windows:

  \program files\veritas\security\authentication\bin\vssat showbrokerhash

- On UNIX systems:

  /opt/VRTSat/bin/vssat showbrokerhash

The output of this command looks similar to the following:

```
Root Hash:      9dfde3d9aaebee084f8e35819c1fed7e6b01d2ae
```

Enter or copy the alphanumeric string into the Root Hash text box (the string you receive is different from the one shown).

11 In the Summary dialog box, review the information you have specified and, if satisfactory, click **Next** to accept it and start the installation.

The Installing Veritas Cluster Management Console dialog box displays a progress bar and a status message window for the installation.

12 When you receive the following message, click **Next**:

```
"Done deleting installation files from node...,"
```

13 In the Completed the Symantec Veritas Cluster Management Console Installation Manager dialog box, click **Finish**.

The installer creates log files at `C:\Documents and Settings\All Users\Application Data\VERITAS\Cluster Management Console`. The file names are Install_GUI_0.log and Install_MSI_0.log. The installer creates Install_GUI_0.log on the system from which you run the cluster connector installation. The installer creates Install_MSI_0.log on the target systems.

Avoiding potential service group faults on secure Windows clusters

During cluster connector installation on secure Windows clusters, the CMC_CC@CMC_SERVICES service account fails to authenticate on the cluster nodes. After installation, the ClusterConnector resource faults on the node where the CMC_CC@CMC_SERVICES account is not authenticated. This result causes the CMC service group to fault. The ClusterConnector.log file contains the error message:

```
Can not get Cache Credential for CMC_CC
```

To avoid potential service group faults on secure Windows clusters

1 At a command prompt, change directory to the following directory:

`Veritas\Security\Authentication\bin`

This may be in

`C:\Program Files or C:\Program Files\Common Files`

2 Run the following command to verify if the CMC_CC credential was created:

vssat showcred | grep CMC_CC

3 Run the following command:

```
"vssat authenticate --domain vx:CMC_SERVICES --prplname CMC_CC
--password  password_for_CMC_CC_user_created_during_MS_install
--broker MS_IPAddress:2821
```

Usage for this command is

```
vssat authenticate  --domain <type:name> [--prplname <prplname>
[--password <password>]] [--broker <host:port>]
```

4 Repeat these steps on each node of the cluster.

Accessing Cluster Management Console information

Information about administering clusters in multi-cluster mode is available in the Veritas Cluster Server Centralized Management Guide. The online help includes information about administering clusters in both single-cluster and multi-cluster mode. If you want to access the information about managing a single cluster in printed documentation, you can install the documentation package to the desired system.

The documentation package name for each supported operating system is:

- AIX—VRTSvcs.doc
- HP-UX—VRTSvcsdc
  Note that you can copy the documents from depot/VRTSvcsdc/ VRTSvcsdc/ opt/ VRTS/docs.
- Linux—VRTSvcsdc
- Solaris—VRTSvcsdc

Verifying the cluster after installation

When you have used installvcs program and chosen to configure and start VCS, it is expected that VCS and all components are properly configured and can start correctly. You must verify that your cluster is operating properly after the installation.

See “Verifying the VCS installation” on page 151.

Installing VCS using installonly option

In certain situations, users may choose to install the VCS filesets on a system before they are ready for cluster configuration. During such situations, the `installvcs -installonly` option can be used. The installation program licenses and installs VCS filesets on the systems entered without creating any VCS configuration files.

Configuring VCS using configure option

If you installed VCS and did not choose to configure VCS immediately, use the `installvcs -configure` option to configure VCS when you are ready for cluster configuration. The installvcs program prompts for cluster information, and creates VCS configuration files without performing installation.

See "Configuring the cluster" on page 65.

The `-configure` option can be used to reconfigure a VCS cluster. VCS must not be running on systems when this reconfiguration is performed.

Performing VCS installation in a secure environment

In secure enterprise environments, `ssh` or `rsh` communication is not allowed between systems. In such cases, the installvcs program can install and configure VCS only on systems with which it can communicate—most often the local system only. When installation is complete, a "response" file is created.

See "Example response file" on page 90.

Note that a response file generated by the installvcs program contains descriptions and explanations of the variables and their values. By copying this file to the other systems in the cluster and editing it to reflect the current local system, you can use the installation program with the `-responsefile` option to install and configure VCS identically on each system without being prompted.

To use installvcs in a secure environment

1. On one node in the cluster, start VCS installation using the installvcs program.
   See "Starting the software installation" on page 62.
2. Review the output as the installer performs the initial system checks.
   The installer detects the inability to communicate between systems.
3. Press Enter to install VCS on one system and create a response file with which you can install on other systems.
   ```
   Would you like to install Cluster Server on systems north only
   and create a responsefile for systems south? [y,n,q] (y)
   ```
4. Enter all cluster information. Proceed with the installation and configuration tasks.
   See "Installing and configuring VCS 5.0" on page 60.
   The installvcs program installs and configures VCS on systems where communication is possible.

5 After the installation is complete, review the installer report.
The installer stores the response file within the file /opt/VRTS/install/logs/installvcs-*universaluniqueidentifier/*installvcs-*universaluniqueidentifier*.response.

6 If you start VCS before VCS is installed and started on all nodes in the cluster, you will see the output similar to:

```
VCS:11306:Did not receive cluster membership, manual
intervention may be needed for seeding
```

7 Using a method of your choice (for example, by using NFS, ftp, or a floppy disk), place a copy of the response file in a directory such as /tmp on the next system to install VCS.

8 On the next system, edit the response file.
For the variables described in the example, change the name of the system to reflect the current local system:

```
.
$CFG{SYSTEMS} = ["east"];
.
.
$CFG{KEYS}{east} = ["XXXX-XXXX-XXXX-XXXX-XXXX-XXX"];
.
```

For demo or site licenses, the license key need not be changed. When license keys are "node-locked" to specific cluster nodes, you must edit the license key.

9 On the next system:

- Mount the product disc.
  See "Mounting the product disc" on page 51.
- Start the software installation using the `installvcs -responsefile` option.
  `# ./installvcs -responsefile /tmp/installvcs-uui.response`
  Where uui is the Universal Unique Identifier that the installer automatically assigned to the response file.
  See "Starting the software installation" on page 62.

10 Repeat step 7 through step 9 until VCS has been installed on all nodes in the cluster.

Performing automated installations

Using installvcs program with the `-responsefile` option is useful not only for installing and configuring VCS within a secure environment, but for conducting unattended installations to other clusters as well. Typically, you can use the response file generated during the installation of VCS on one cluster to install

VCS on other clusters. You can copy the file to a system in another cluster and manually edit the file to contain appropriate values.

Assuming the systems are set up and meet the requirements for installation, you can perform unattended installation from one of the cluster systems where you have copied the response file.

To perform unattended installation

1 Navigate to the folder containing the installvcs program.

```
# cd /cdrom/cluster_server
```

2 Start the installation from one of the cluster systems where you have copied the response file.

```
# ./installvcs -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Syntax used in response file

The syntax of Perl statements included in the response file varies, depending on whether "Scalar" or "List" values are required by the variables.

For example,

```
$CFG{Scalar_variable}="value";
```

or, in the case of an integer value:

```
$CFG{Scalar_variable}=123;
```

or, in the case of a list:

```
$CFG(List_variable}=["value", "value", "value"];
```

Example response file

The example response file resembles the file created by installvcs after the example VCS installation. It is a modified version of the response file generated on vcs_cluster2 that you can use to install VCS on vcs_cluster3. Review the variables required for installation.

See Table 3-6, "Response file variables."

```
#
# installvcs configuration values:
#
$CPI::CFG{AT_ROOTDOMAIN}="root\@east.symantecexample.com";
$CPI::CFG{CMC_CC_CONFIGURED}=1;
$CPI::CFG{CMC_CLUSTERID}{east}=1146235600;
$CPI::CFG{CMC_MSADDR}{east}="mgmtserver1";
$CPI::CFG{CMC_MSADDR}{west}="mgmtserver1";
$CPI::CFG{CMC_MS_ROOT_HASH}="758a33dbd6fae751630058ace3dedb54e5
62fe98";
$CPI::CFG{CMC_SERVICE_PASSWORD}="U2FsdGVkX18vE5tn0hTSWwodThACc+
rX";
```

```
$CPI::CFG{ENCRYPTED}="U2FsdGVkX1+k2DHKVcnW7b6vrVghdh+zW4G0WFj5I
JA=";
$CPI::CFG{KEYS}{east}=[ qw(XXXX-XXXX-XXXX-XXXX-XXXX-XXX) ];
$CPI::CFG{KEYS}{west}=[ qw(XXXX-XXXX-XXXX-XXXX-XXXX-XXX) ];
$CPI::CFG{OBC_IGNOREWARNINGS}=0;
$CPI::CFG{OBC_MODE}="STANDALONE";
$CPI::CFG{OPT}{INSTALL}=1;
$CPI::CFG{OPT}{NOEXTRAPKGS}=1;
$CPI::CFG{OPT}{RSH}=1;
$CPI::CFG{SYSTEMS}=[ qw(east west) ];
$CPI::CFG{UPI}="VCS";
$CPI::CFG{VCS_ALLOWCOMMS}="Y";
$CPI::CFG{VCS_CLUSTERID}=13221;
$CPI::CFG{VCS_CLUSTERNAME}="vcs_cluster3";
$CPI::CFG{VCS_CSGNETMASK}="255.255.240.0";
$CPI::CFG{VCS_CSGNIC}{ALL}="en0";
$CPI::CFG{VCS_CSGVIP}="10.10.12.1";
$CPI::CFG{VCS_LLTLINK1}{east}="en2";
$CPI::CFG{VCS_LLTLINK1}{west}="en2";
$CPI::CFG{VCS_LLTLINK2}{east}="en3";
$CPI::CFG{VCS_LLTLINK2}{west}="en3";
$CPI::CFG{VCS_SMTPRECP}=[ qw(earnie@symantecexample.com) ];
$CPI::CFG{VCS_SMTPRSEV}=[ qw(SevereError) ];
$CPI::CFG{VCS_SMTPSERVER}="smtp.symantecexample.com";
$CPI::CFG{VCS_SNMPCONS}=[ qw(neptune) ];
$CPI::CFG{VCS_SNMPCSEV}=[ qw(SevereError) ];
$CPI::CFG{VCS_SNMPPORT}=162;
```

Response file variable definitions

Table 3-6 lists the variables used in the response file and their definitions. Note that while some variables are labeled as required and others as optional, some of the optional variables, if used, make it necessary to define other optional variables. For example, all variables related to the cluster service group (CSGNIC, CSGVIP, and CSGNETMASK) must be defined if any are defined. The same is true for the SMTP notification (SMTPSERVER, SMTPRECP, and SMTPRSEV), SNMP trap notification (SNMPPORT, SNMPCONS, and SNMPCSEV), and the Global Cluster Option (CGONIC, GCOVIP, and GCONETMASK).

Table 3-6 Response file variables

Variable	List/ Scalar	Opt'l/ Req'd	Description
$CPI::CFG{OPT}{INSTALL}	Scalar	Req'd	List of systems where VCS must be installed and configured.
$CPI::CFG{OPT}{INSTALLONLY}	Scalar	Opt'l	List of systems where VCS filesets must be installed. Configuration can be performed at a later time using the `-configure` option.
$CPI::CFG{SYSTEMS}	List	Req'd	List of systems on which the product is to be installed, uninstalled, or configured.
$CPI::CFG{SYSTEMSCFG}	List	Opt'l	List of systems to be recognized in configuration if secure environment prevents all systems from being installed at once.
$CPI::CFG{UPI}	Scalar	Req'd	Defines the product to be installed, uninstalled, or configured.
$CPI::CFG{OPT}{KEYFILE}	Scalar	Opt'l	Defines the location of an ssh keyfile that is used to communicate with all remote systems.
$CPI::CFG{OPT}{LICENSE}	Scalar	Opt'l	Licenses VCS only.
$CPI::CFG{OPT}{NOLIC}	Scalar	Opt'l	installs the product without any license.
$CPI::CFG{AT_ROOTDOMAIN}	List	Opt'l	Defines the name of the system where the root broker is installed.
$CPI::CFG{OPT}{PATCHPATH}	Scalar	Opt'l	Defines a location, typically an NFS mount, from which all remote systems can install product patches. The location must be accessible from all target systems.

Table 3-6 Response file variables

Variable	List/ Scalar	Opt'l/ Req'd	Description
$CPI::CFG{OPT}{PKGPATH}	Scalar	Opt'l	Defines a location, typically an NFS mount, from which all remote systems can install product depots. The location must be accessible from all target systems.
$CPI::CFG{OPT}{TMPPATH}	Scalar	Opt'l	Defines the location where a working directory is created to store temporary files and depots needed during the install. The default location is /var/tmp.
$CPI::CFG{OPT}{RSH}	Scalar	Opt'l	Defines that `rsh` must be used instead of ssh as the communication method between systems.
$CPI::CFG{DONOTINSTALL}{*FILESET*}	List	Opt'l	Instructs the installation to not install the optional filesets designated in the list.
$CPI::CFG{DONOTREMOVE}{*FILESET*}	List	Opt'l	Instructs the uninstallation to not remove the optional filesets designated in the list.
$CPI::CFG{VCS_CLUSTERNAME}	Scalar	Req'd	Defines the name of the cluster.
$CPI::CFG{VCS_CLUSTERID}	Scalar	Req'd	An integer between 0 and 65535 that uniquely identifies the cluster.
$CPI::CFG{KEYS}{*SYSTEM*}	Scalar	Opt'l	List of keys to be registered on the system.
$CPI::CFG{OPT_LOGPATH}	Scalar	Opt'l	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs.
$CPI::CFG{CONFIGURE}	Scalar	Opt'l	Performs configuration if the filesets are already installed using the `-installonly` option.

Table 3-6 Response file variables

Variable	List/ Scalar	Opt'l/ Req'd	Description
$CPI::CFG{VCS_LLTLINK#} {*SYSTEM*}	Scalar	Req'd	Defines the NIC to be used for a private heartbeat link on each system. Two LLT links are required per system (LLTLINK1 and LLTLINK2). Up to four LLT links can be configured.
$CPI::CFG{VCS_LLTLINKLOWPRI} {*SYSTEM*}	Scalar	Opt'l	Defines a low priority heartbeat link. Typically, LLTLINKLOWPRI is used on a public network link to provide an additional layer of communication.
$CPI::CFG{VCS_CSGNIC}	Scalar	Opt'l	Defines the NIC for Cluster Management Console to use on a system. 'ALL' can be entered as a system value if the same NIC is used on all systems.
$CPI::CFG{CSGVIP}	Scalar	Opt'l	Defines the virtual IP address to be used by the Cluster Management Console.
$CPI::CFG{VCS_CSGNETMASK}	Scalar	Opt'l	Defines the Netmask of the virtual IP address to be used by the Cluster Management Console.
$CPI::CFG{VCS_SMTPSERVER}	Scalar	Opt'l	Defines the domain-based hostname (example: smtp.symantecexample.com) of the SMTP server to be used for web notification.
$CPI::CFG{VCS_SMTPRECP}	List	Opt'l	List of full email addresses (example: user@symantecexample.com) of SMTP recipients.

Table 3-6 Response file variables

Variable	List/ Scalar	Opt'l/ Req'd	Description
$CPI::CFG{VCS_SMTPRSEV}	List	Opt'l	Defines minimum severity level of messages (Information, Warning, Error, SevereError) that listed SMTP recipients are to receive. Note that the ordering of severity levels must match that of the addresses of SMTP recipients.
$CPI::CFG{VCS_SNMPPORT}	Scalar	Opt'l	Defines the SNMP trap daemon port (default=162).
$CPI::CFG{VCS_SNMPCONS}	List	Opt'l	List of SNMP console system names
$CPI::CFG{VCS_SNMPCSEV}	List	Opt'l	Defines minimum severity level of messages (Information, Warning, Error, SevereError) that listed SNMP consoles are to receive. Note that the ordering of severity levels must match that of the SNMP console system names.
$CPI::CFG{VCS_GCONIC}{*SYSTEM*}	Scalar	Opt'l	Defines the NIC for the Virtual IP used for the Global Cluster Option. 'ALL' can be entered as a system value if the same NIC is used on all systems.
$CPI::CFG{VCS_GCOVIP}	Scalar	Opt'l	Defines the virtual IP address to be used by the Global Cluster Option.
$CPI::CFG{VCS_GCONETMASK}	Scalar	Opt'l	Defines the Netmask of the virtual IP address to be used by the Global Cluster Option.
$CPI::CFG{VCS_USERENPW}	List	Opt'l	List of encoded passwords for users
$CPI::CFG{VCS_USERNAME}	List	Opt'l	List of names of users
$CPI::CFG{VCS_USERPRIV}	List	Opt'l	List of privileges for users

Table 3-6 Response file variables

Variable	List/ Scalar	Opt'l/ Req'd	Description
$CPI::CFG{OPT}{UNINSTALL}	Scalar	Opt'l	List of systems where VCS must be uninstalled.

Checking licensing information on the system

You can use the vxlicrep program to display information about the licenses on a system.

To check licensing information

1 Navigate to the folder containing the `vxlicrep` program and enter:

```
# cd /opt/VRTS/bin
# ./vxlicrep
```

2 Review the output to determine:

- The license key
- The type of license
- The product for which it applies
- Its expiration date, if any. Demo keys have expiration dates, permanent keys and site keys do not.

```
License Key                    = xxx-xxx-xxx-xxx-xxx
Product Name                   = Veritas Cluster Server
Serial Number                  = 1249
License Type                   = PERMANENT
OEM ID                         = 478

Features :=
  Platform                     = AIX
  Version                      = 5.0
  Tier                         = 0
  Reserved                     = 0

  Mode                         = VCS
```

Updating product licenses using vxlicinst

You can use the `vxlicinst` command to add the VCS license key on each node. If you have VCS already installed and configured and you are using a demo license, you can replace the demo license.

See "Replacing a VCS demo license with a permanent license" on page 97.

To update product licenses

- On each node, enter the license key using the command:

```
# cd /opt/VRTS/bin
# ./vxlicinst -k XXXX-XXXX-XXXX-XXXX-XXXX-XXX
```

Replacing a VCS demo license with a permanent license

When a VCS demonstration key license expires, you can replace it with a permanent license using the `vxlicinst(1)` program.

To replace a demo key

1. Make sure you have permissions to log in as root on each of the nodes in the cluster.
2. Shut down VCS on all nodes in the cluster:

   ```
   # hastop -all -force
   ```

   This does not shut down any running applications.
3. Enter the permanent license key using the following command on *each* node:

   ```
   # cd /opt/VRTS/bin
   # ./vxlicinst -k XXXX-XXXX-XXXX-XXXX-XXXX-XXX
   ```
4. Make sure demo licenses are replaced on all cluster nodes before starting VCS.
5. Start VCS on each node:

   ```
   # hastart
   ```

About installvcs command options

Table 3-7 lists the `installvcs` command options. In addition to the `-precheck`, `-responsefile`, `-installonly`, and `-configure` options, the installvcs program has other useful options.

The `installvcs` command usage takes the following form:

`installvcs [ system1 system2... ] [ options ]`

Table 3-7 installvcs options

Option and Syntax	Description
`-configure`	Configure VCS after using `-installonly` option to install VCS. See "Configuring VCS using configure option" on page 88.

Table 3-7 installvcs options

Option and Syntax	Description
`-enckeyfile` *`encryption_key_file`*	See the `-responsefile` and the `-encrypt` options.
`-encrypt` *`password`*	Encrypt *password* using the encryption key provided with the `-enckeyfile` option so that the encrypted password can be stored in response files.
`-installonly`	Install product filesets on systems without configuring VCS. See "Installing VCS using installonly option" on page 87.
`-installpkgs`	Display VCS packages in correct installation order. Output can be used to create scripts for command line installs, or for installations over a network. See the `requiredpkgs` option.
`-keyfile` *`ssh_key_file`*	Specifies a key file for SSH. The option passes `-i` *`ssh_key_file`* with each SSH invocation.
`-license`	Register or update product licenses on the specified systems. Useful for replacing demo license.
`-logpath` *`log_path`*	Specifies that *log_path*, not /opt/VRTS/install/logs, is the location where installvcs log files, summary file, and response file are saved.
`-noextrapkgs`	Specifies that additional product filesets such as VxVM and VxFS need not be installed. **Note:** VCS product upgrades in the future can be simplified if you do not install additional product filesets.
`-nolic`	Install product filesets on systems without licensing or configuration. License-based features or variants are not installed when using this option.
`-nooptionalpkgs`	Specifies that the optional product filesets such as man pages and documentation need not be installed.
`-nostart`	Bypass starting VCS after completing installation and configuration.
`-patchpath` *`patch_path`*	Specifies that *patch_path* contains all patches to be installed by installvcs program on all systems; *patch_path* is the complete path of a directory. **Note:** You can use this option when you download recent versions of patches.

Table 3-7 installvcs options

Option and Syntax	Description
`-pkgpath` *pkg_path*	Specifies that *pkg_path* contains all filesets to be installed by installvcs program on all systems; *pkg_path* is the complete path of a directory, usually NFS mounted.
`-precheck`	Verify that systems meet the installation requirements before proceeding with VCS installation. Symantec recommends doing a precheck before installing VCS. See "Checking the systems for installation" on page 61.
`-requiredpkgs`	Displays all required VCS packages in correct installation order. Optional packages are not listed. Output can be used to create scripts for command line installs, or for installations over a network. See `installpkgs` option.
`-responsefile` *response_file* [`-enckeyfile` *encryption_key_file*]	Perform automated VCS installation using system and configuration information stored in a specified file instead of prompting for information. The *response_file* must be a full path name. If not specified, the response file is automatically generated as installerer*number*.response where *number* is random. You must edit the response file to use it for subsequent installations. Variable field definitions are defined within the file. The `-enckeyfile` option and *encryption_key_file* name are required with the `-responsefile` option when the response file contains encrypted passwords. See "Performing VCS installation in a secure environment" on page 88. See "Performing automated installations" on page 89.
`-rsh`	Specifies that `rsh` and `rcp` are to be used for communication between systems instead of `ssh` and `scp`. This option requires that systems be pre-configured such that `rsh` commands between systems execute without prompting for passwords or confirmations
`-security`	Enable or disable Symantec Product Authentication Service in a VCS cluster that is running. Install and configure Root Broker for Symantec Product Authentication Service. See "Symantec Product Authentication Service" on page 22.

Table 3-7 installvcs options

Option and Syntax	Description
`-tmppath tmp_path`	Specifies that *tmp_path*, not /var/tmp, is the working directory for installvcs program. This destination is where initial logging is performed and where filesets are copied on remote systems before installation.

About the uninstallvcs program

You can uninstall VCS from all nodes in the cluster or from specific nodes in the cluster using the uninstallvcs program. The uninstallvcs program does not automatically uninstall VCS enterprise agents, but offers uninstallation if proper fileset dependencies on VRTSvcs are found.

If uninstallvcs program does not remove an enterprise agent, see the documentation for the specific enterprise agent for instructions on removing it.

Prerequisites

- Before removing VCS from any node in the cluster, you must shut down applications such as Java Console or any VCS enterprise agents that depend on VCS.
- Before removing VCS from fewer than all nodes in a cluster, make sure that no service groups are running on the nodes from which VCS is uninstalled. You must also reconfigure VCS on the remaining nodes.
  See "Adding and removing cluster nodes" on page 183.

Uninstalling VCS 5.0

The example demonstrates how to uninstall VCS on two nodes: north and south.

See "Sample VCS installation and configuration output" on page 217.

Removing VCS 5.0 filesets

The program stops the VCS processes that are currently running during the uninstallation process.

To uninstall VCS

1. Do one of the following to begin uninstalling:
   - If you can execute commands as superuser on the remote nodes in the cluster using `ssh` or `rsh` without supplying a password, run uninstallvcs program on one node to uninstall VCS on all nodes in the cluster.
   - If you cannot execute commands as superuser on remote nodes in the cluster using `ssh` or `rsh`, you must run uninstallvcs program on each node in the cluster.
2. Start uninstallvcs program.

   ```
   # cd /opt/VRTS/install
   # ./uninstallvcs
   ```

   The program specifies the directory where the logs are created and displays a copyright notice followed by a description of the cluster:

   ```
   VCS configuration files exist on this system with the following
   information:

       Cluster Name: VCS_cluster2
       Cluster ID Number: 7
       Systems: north south
       Service Groups: ClusterService groupA groupB
   ```

3. Answer the prompt to proceed with uninstalling the software.
   - To uninstall VCS on all nodes, press **Enter**.
   - To uninstall VCS only on specific nodes, enter **n**.

     Note that if you enter **n** or if no VCS configuration files are found on the local node, the uninstallvcs program prompts you to enter a list of nodes from which you want to uninstall VCS.

     ```
     Do you want to uninstall VCS from these systems? [y,n,q] (y)
     ```

4. Review the output as the uninstallvcs program continues to verify communication between systems and check the installations on each system to determine the filesets to be uninstalled.
5. If filesets, such as enterprise agents, are found to be dependent on a VCS fileset, the uninstaller prompt you on whether you want them removed. Enter **y** to remove the designated filesets.
6. Review the uninstaller report after the verification.
7. Press Enter to uninstall the VCS filesets.

   ```
   Are you sure you want to uninstall VCS filesets? [y,n,q] (y)
   ```

8. Review the output as the uninstaller stops processes, unloads kernel modules, and removes the filesets.

9 Note the location of summary and log files that the uninstaller creates after removing all the filesets.

Running uninstallvcs from the VCS 5.0 disc

If you need to uninstall VCS after an incomplete installation, or if the uninstallvcs program is not available in /opt/VRTS/install, you may need to use the uninstallvcs program on the VCS 5.0 disc.

Uninstalling the Cluster Management Console management server

You must run the management server uninstallation on the management server host system.

Uninstalling the management server from Solaris systems

Use this procedure to remove the Cluster Management Console management server from the standalone management server host system.

The default installer option is -ssh. If you are performing a remote uninstallation and ssh is not enabled, run the installer program with the -rsh option. Otherwise, the installer generates an error during the uninstallation.

To uninstall the management server from Solaris systems

1 Insert the product disc into the drive on the local system. At the command prompt, type the following command to run the installer program:

```
./installer [-rsh]
```

The installer program presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2 Enter **u** to specify uninstallation.

```
Enter a Task: [I,C,L,P,U,D,Q,?] u
```

The installer program displays another menu that lists products that are available for uninstallation.

3 Enter the menu number that corresponds to Veritas Cluster Management Console.

```
Select a product to uninstall:nn
```

The installer program presents a description of the product.

4 Enter **1** when you are prompted to select a product component.

```
Enter '1' to uninstall the Management Server, '2' to install the
Cluster Connector: [1-2,q] (1) 1
```

The installer program presents a message.

5 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

It performs an initial system check of the local system and checks for installed packages on the local system. If these checks are satisfactory, the installer program lists the packages to be uninstalled.

6 Enter **y** to verify that you want to uninstall the management server.

```
Are you sure you want to uninstall CMC? [y,n,q] (y)
```

The installer program lists package dependencies and uninstallation progress percentages. If the uninstallation is successful, the installer program displays this message followed by the location of the uninstallation logs:

```
Uninstall completed successfully
```

Uninstalling the management server from Windows systems

Use this procedure to remove the Cluster Management Console management server from the standalone management server host system.

To uninstall the management server on Windows

1 On the Windows task bar, click **Start** > **Settings** > **Control Panel** > **Add or Remove Programs**.

2 In the Add or Remove Programs control panel, in the Currently installed programs list, click **Veritas Cluster Management Console Management Server**.

You may have to scroll through the list to find this entry.

3 On the right side of the selected entry, click **Remove**.

4 Follow the prompts in the uninstallation wizard, if any.

Uninstalling the Cluster Management Console cluster connector

Perform the following procedure to remove the cluster connector from UNIX or Windows systems.

Uninstalling cluster connector from UNIX systems

Use this procedure to remove the Cluster Management Console cluster connector from each cluster.

On UNIX systems, the default installer option is -ssh. If you are performing a remote uninstallation and ssh is not enabled, run the installer program with the -rsh option. Otherwise, the installer generates an error during the uninstallation.

To uninstall cluster connector from UNIX systems

1 Insert the product disc into the drive on the local system. At the command prompt, type the following command to run the installer program:

```
./installer [-rsh]
```

The installer program presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2 Enter **u** to specify uninstallation.

```
Enter a Task: [I,C,L,P,U,D,Q,?] u
```

The installer program displays another menu that lists products that are available for uninstallation.

3 Enter the menu number that corresponds to Veritas Cluster Management Console.

```
Select a product to uninstall:nn
```

The installer program presents a description of the product.

4 Enter **2** if you are prompted to select a product component. Otherwise, skip to step 6.

```
Enter '1' to install the Management Server, '2' to install the
Cluster Connector: [1-2,q] (1) 2
```

The installer program presents a message stating that it will uninstall cluster connector.

5 The uninstall program prompts you for the name of at least one node in the cluster.

```
Enter one system name from each cluster separated by spaces from
which to uninstall CMC: sysA
```

Based on this, it determines the nodes from which to uninstall and perform the necessary checks.

Note: If you get an error message similar to this:

```
Checking ssh communication with sysA Enter passphrase for key
'/.ssh/id_dsa'
```

You must return and set up ssh.

---

6 Enter **y** to verify that the information up to this point is correct.

```
Is this information correct? [y,n,q] (y)
```

The installer program performs an initial system check of the cluster nodes and checks for installed packages on the cluster nodes. If these checks are satisfactory, the installer program lists the packages to be uninstalled.

7 Enter **y** to verify that you want to uninstall cluster connector.

```
Are you sure you want to uninstall CMC? [y,n,q] (y)
```

The installer program lists package dependencies and uninstallation progress percentages. If the uninstallation is successful, the installer program displays this message followed by the location of the uninstallation logs:

```
Uninstall completed successfully
```

Uninstalling cluster connector from Windows platforms

Use this procedure to remove the Cluster Management Console cluster connector from each cluster node.

To uninstall cluster connector on Windows

1 Insert the product disc into the DVD drive on the local system.

2 On the product disc, locate the \install directory for Cluster Management Console in the \windows folder.

3 Double-click the **setup.bat** file.

Depending upon the operating system, you may or may not receive the following warning message:

```
The publisher could not be verified. Are you sure you want to
run this software?
```

If you receive this message, click **Run**.

4 In the Welcome to the Veritas Cluster Management Console Installation Manager dialog box, read the introduction and then click **Next**.

5 In the Installation and Configuration Options dialog box, click **Uninstall cluster connectors** and then click **Next**.

6 Follow the prompts in the uninstallation wizard. When available, click **Finish** to close the wizard.

Chapter 4

Manually installing and configuring VCS

This chapter contains the following topics:

About VCS manual installation

You can manually install and configure VCS instead of using the installvcs program. Perform a manual installation when:

- You are installing a single VCS fileset.
- You are installing VCS to one system in a cluster already running VCS 5.0.
- You are unable to install on a system over the network. This can occur when you do not have remote root user access.

A manual installation takes a lot of time, patience, and care. Symantec strongly recommends that you use the installvcs program instead of the manual installation when possible.

Requirements for installing VCS

Review requirements and verify that you are ready to install the VCS software.

See “Preparing to install and configure VCS” on page 21.

Installing VCS software manually

Table 4-1 lists the tasks involved in manually installing and configuring VCS 5.0.

Table 4-1 Tasks involved in manually installing VCS 5.0

Task	Reference
Modify /etc/pse.conf to enable the ethernet driver.	"Modifying /etc/pse.conf to enable the Ethernet driver" on page 108
Install VCS software manually on each node in the cluster.	"Installing VCS filesets for a manual installation" on page 110
Add a license key.	"Adding a license key" on page 111
Restore the configuration files from your previous VCS installation.	"Upgrading the configuration files" on page 111
Install the VCS cluster manager.	"Installing the Cluster Manager" on page 111
Copy the installation guide to each node.	"Copying the installation guide to each node" on page 112
Configure LLT and GAB.	"Configuring LLT and GAB" on page 112
Configure VCS.	"Configuring VCS" on page 114
Start LLT, GAB, and VCS services.	"Starting LLT, GAB, and VCS" on page 115
Modify the VCS configuration.	"Modifying the VCS configuration" on page 116
Replace demo license with a permanent license.	"Replacing a VCS demo license with a permanent license" on page 116

Modifying /etc/pse.conf to enable the Ethernet driver

Before you install VCS, examine the /etc/pse.conf file on each system to see if the Ethernet driver is configured. If the driver is not configured, you must modify the file and reboot the system.

To enable the Ethernet driver

1. Check to see if the Ethernet driver is configured in the /etc/pse.conf file:
   ```
   # egrep 'ethernet driver' /etc/pse.conf
   ```
2. In the output, examine the line containing the "ethernet driver" expression:
   ```
   #d+ dlpi en /dev/dlpi/en # streams dlpi ethernet driver
   ```
3. If the comment symbol ("#") precedes the line, the Ethernet driver is not configured. Using vi or another text editor, edit the file:
   ```
   # vi /etc/pse.conf
   ```
4. Find the section in the file labeled "#PSE drivers" and look for the line shown in step 2. Uncomment the line by removing the initial "#" symbol.
5. Save and close the file.
6. To configure the driver, reboot the system.
7. Repeat step 1 through step 6 on each system in the cluster.

Preparing for a manual installation

Before you install, log in as the superuser. You then mount the disc and put the files in a temporary folder for installation.

See "Mounting the product disc" on page 51.

To prepare for installation

1. Copy the compressed fileset files from the software disc to the temporary directory:
   ```
   # cp -r cluster_server/pkgs/* /tmp/install
   ```
2. Go to the temporary directory and unzip the compressed fileset files:
   ```
   # cd /var/tmp
   # gunzip *.gz
   ```
3. If your system does not have the `gunzip` utility, copy it from the disc:
   ```
   # cp /cdrom_path/gnu/gunzip /var/tmp
   ```
4. List the files:
   ```
   # ls /var/tmp
   SYMClma.image              VRTSobc33.bff
   VRTSacclib.rte.bff         VRTSobgui.bff
   VRTSat.image               VRTSpbx.bff
   VRTScmccc.rte.bff          VRTSperl.rte.bff
   VRTScmcs.rte.bff           VRTSsmf.bff
   VRTScpi.rte.bff            VRTSspt.bff
   VRTScscm.rte.bff           VRTSvcs.doc.bff
   VRTScscw.rte.bff           VRTSvcs.man.bff
   VRTScssim.rte.bff          VRTSvcs.msg.en_US.bff
   VRTScutil.rte.bff          VRTSvcs.rte.bff
   ```

```
VRTSdsa.bff                VRTSvcsag.rte.bff
VRTSgab.rte.bff            VRTSveki.bff
VRTSicsco.bff              VRTSvlic.bff
VRTSjre.rte.bff            VRTSvxfen.rte.bff
VRTSjre15.rte.bff          VRTSweb.rte.bff
VRTSllt.rte.bff
VRTSob.bff
```

Installing VCS filesets for a manual installation

VCS has both required and optional filesets. Install the required filesets first. All filesets are installed in the /opt directory.

When selecting the optional filesets, note:

- Symantec recommends that you install the filesets for VCS manual pages (VRTSvcs.man) and VCS documentation (VRTSvcs.doc). Install the documentation fileset on nodes where you want access to the documentation.
- The I/O fencing fileset (VCSvxfen) can be used only with shared disks that support SCSI-3 Persistent Reservations (PR). See the *Veritas Cluster Server User's Guide* for a conceptual description of I/O fencing. You need to test shared storage for SCSI-3 PR and to implement I/O fencing.
  See "Setting up I/O fencing" on page 119.
- The VCS configuration wizard (VRTScscw) fileset includes wizards for the installation and configuration of Veritas products that require VCS configuration.
- To use the Java Console with VCS Simulator, you must install the VRTScssim and VRTScscm filesets.

Perform the steps to install VCS filesets on each node in the cluster.

To install VCS filesets on a node

1 Install the required filesets in the order shown:

```
# installp -a -d VRTSperl.rte.bff VRTSperl
# installp -a -d VRTSvlic.bff VRTSvlic
# installp -a -d VRTSicsco.bff VRTSicsco
# installp -a -d VRTSpbx.bff VRTSpbx
# installp -a -d VRTSsmf.bff VRTSsmf
# installp -a -d VRTSat.image VRTSat
# installp -a -d VRTSspt.bff VRTSspt
# installp -a -d SYMClma.image SYMClma
# installp -a -d VRTSveki.bff VRTSveki
# installp -a -d VRTSllt.rte.bff VRTSllt.rte
# installp -a -d VRTSgab.rte.bff VRTSgab.rte
# installp -a -d VRTSvxfen.rte.bff VRTSvxfen.rte
```

```
# installp -a -d VRTSvcs.rte.bff VRTSvcs.rte
# installp -a -d VRTSvcsag.rte.bff VRTSvcsag.rte
# installp -a -d . VRTSvcs.msg.en_US.bff VRTSvcs.msg.en_US
# installp -a -d VRTSjre15.rte.bff VRTSjre15.rte
# installp -a -d VRTScutil.rte.bff VRTScutil.rte
# installp -a -d VRTScscw.rte.bff VRTScscw.rte
# installp -a -d VRTScscw.rte.bff VRTScscw.rte
# installp -a -d VRTSweb.rte.bff VRTSweb.rte
# installp -a -d VRTSacclib.rte.bff VRTSacclib.rte
```

2 Install the optional filesets in the order shown. Omit those that you do not want to install.

```
# installp -a -d . VRTSvcs.man.bff VRTSvcs.man
# installp -a -d . VRTSvcs.doc.bff VRTSvcs.doc
# installp -a -d VRTScssim.rte.bff VRTScssim.rte
# installp -a -d VRTScscm.rte.bff VRTScscm.rte
# installp -a -d VRTScmcs.rte.bff VRTScmcs.rte
# installp -a -d VRTScmccc.rte.bff VRTScmccc.rte
```

Adding a license key

After you have installed all filesets on each cluster node, use the `vxlicinst` command to add the VCS license key on each system:

```
# cd /opt/VRTS/bin
# ./vxlicinst -k XXXX-XXXX-XXXX-XXXX-XXXX-XXX
```

Checking licensing information on the system

Use the `vxlicrep` utility to display information about all Veritas licenses on a system. For example, enter:

```
# cd /opt/VRTS/bin
# ./vxlicrep
```

From the output, you can determine the license key, the type of license, the product for which it applies, and its expiration date, if any. Demo keys have expiration dates, while permanent keys and site keys do not.

Upgrading the configuration files

You need to restore the configuration files from your previous VCS installation if you manually added 5.0 filesets to upgrade your cluster to VCS.

See “Upgrading VCS to 5.0” on page 166.

Installing the Cluster Manager

If you did not install Cluster Manager (the VCS Java-based graphical user interface fileset), VRTScscm, you can do it later.

Copying the installation guide to each node

After you install VCS, Symantec recommends that you copy the PDF version of this guide from the installation disc (cluster_server/docs/vcs_install.pdf) to the directory /opt/VRTS/docs on each node to make it available for reference.

Configuring LLT and GAB

VCS uses LLT and GAB to replace the functions of TCP/IP for VCS private network communications. LLT and GAB provide the performance and reliability required by VCS for these and other functions.

LLT and GAB must be configured as described in the following sections.

Configuring low latency transport (LLT)

To configure LLT, set up two files: /etc/llthosts and /etc/lltab on each node in the cluster.

Setting up /etc/llthosts

The file llthosts(4) is a database, containing one entry per system that links the LLT system ID (in the first column) with the LLT host name. You must create an identical file on each node in the cluster.

Use vi, or another editor, to create the file /etc/llthosts that contains entries that resemble:

```
0 north
1 south
```

Setting Up /etc/lltab

The /etc/lltab file must specify the system's ID number (or, its node name), and the network links that correspond to the system. In addition, the file can contain other directives. Refer also to the sample lltab file in /opt/VRTSllt.

See "LLT directives" on page 113.

Using vi or another editor, create the file /etc/lltab that contains entries that resemble:

```
set-node north
set-cluster 2
link en2 /dev/dlpi/en:2 - ether - -
link en3 /dev/dlpi/en:3 - ether - -
```

The first line must identify the system on which the file exists. In the example above, the value for `set-node` could be north, 0, or the file name /etc/nodename, provided the file contains the name of the system (north in this example). The next two lines, beginning with the link command, identify the two private network cards that the LLT protocol uses. The order of directives must be the same as in the sample file /opt/VRTSllt/lltab.

LLT directives

For more information about LLT directives, refer to the `lltab`(4) manual page.

Table 4-2 LLT directives

Directive	Description
`set-node`	Assigns the system ID or symbolic name. The system ID number must be unique for each system in the cluster, and must be in the range 0-31. The symbolic name corresponds to the system ID listed in /etc/llthosts file. Note that LLT fails to operate if any systems share the same ID.
`link`	Attaches LLT to a network interface. At least one link is required, and up to eight are supported. The first argument to link is a user-defined tag shown in the `lltstat(1M)` output to identify the link. It may also be used in `lltab` to set optional static MAC addresses. The second argument to link is the device name of the network interface. Its format is *device_name*:*device_instance_number*. The remaining four arguments to link are defaults; these arguments should be modified only in advanced configurations. There should be one link directive for each network interface. LLT uses an unregistered Ethernet SAP of 0xCAFE. If the SAP is unacceptable, refer to the `lltab(4)` manual page for information on how to customize SAP. Note that IP addresses do not need to be assigned to the network device; LLT does not use IP addresses.
`set-cluster`	Assigns a unique cluster number. Use this directive when more than one cluster is configured on the same physical network connection. LLT uses a default cluster number of zero.
`link-lowpri`	Use this directive in place of `link` for public network interfaces. This directive prevents VCS communication on the public network until the network is the last link, and reduces the rate of heartbeat broadcasts. Note that LLT distributes network traffic evenly across all available network connections and, in addition to enabling VCS communication, broadcasts heartbeats to monitor each network connection.

For more information about LLT directives, refer to the `lltab`(4) manual page.

Additional considerations for LLT

You must attach each network interface that is configured for LLT to a separate and distinct physical network.

Configuring group membership and atomic broadcast (GAB)

To configure GAB, use vi or another editor to set up an /etc/gabtab configuration file on each node in the cluster. The following example shows a simple /etc/gabtab file:

```
/sbin/gabconfig -c -nN
```

Where the `-c` option configures the driver for use and `-nN` specifies that the cluster is not formed until at least *N* systems are ready to form the cluster. By default, *N* is the number of systems in the cluster.

Note: Symantec does not recommend the use of the `-c -x` option for `/sbin/gabconfig`. Using `-c -x` dramatically increases configuration time for the Gigabit Ethernet controller and can lead to a split-brain condition.

Configuring VCS

VCS configuration requires the types.cf and main.cf files on each system in the cluster. Both of the files are in the /etc/VRTSvcs/conf/config directory.

main.cf file

The main.cf configuration file requires the following minimum essential elements:

- An “include” statement that specifies the file, types.cf, which defines the VCS bundled agent resources.
- The name of the cluster.
- The name of the systems that make up the cluster.

Editing the main.cf file

When you manually install VCS, the file /etc/VRTSvcs/conf/config/main.cf contains only the line:

```
include "types.cf"
```

To edit the main.cf file

1. Log in as superuser, and move to the directory containing the configuration file:

   ```
   # cd /etc/VRTSvcs/conf/config
   ```

2. Using vi, or another text editor, edit the main.cf file, defining your cluster name and system names. Refer to the following example.

3 Save and close the file.

Refer to the *Veritas Cluster Server User's Guide* for a full description of the main.cf file, how to edit it and verify it.

Example, main.cf

An example main.cf for a two-node cluster:

```
include "types.cf"
cluster VCSCluster2 ( )
system north
system south
```

An example main.cf for a single-node cluster:

```
include "types.cf"
cluster VCSCluster1 ( )
system sn1
```

types.cf file

Note that the "include" statement in main.cf refers to a file named types.cf. This text file describes the VCS bundled agent resources. During new installations, the types.cf file is automatically copied in to the /etc/VRTSvcs/conf/config directory.

Starting LLT, GAB, and VCS

To start LLT

- On each node, type:

  ```
  # /etc/rc.d/rc2.d/S70llt start
  ```

  If LLT is configured correctly on each node, the console output resembles:

  ```
  Apr  5 14:46:18 north llt: LLT:10009: LLT Protocol available
  ```

  See "Verifying LLT" on page 158.

To start GAB

- On each node, type:

  ```
  # /etc/rc.d/rc2.d/S92gab start
  ```

  If GAB is configured correctly on each node, the console output resembles:

  ```
  Apr  5 14:46:29 north gab: GAB:20021: GAB available
  Apr  5 14:51:50 north gab: GAB:20026: Port a registration
  waiting for seed port membership
  ```

  See "Verifying GAB" on page 159.

To start VCS

- On each node, type:

  ```
  # /etc/rc.d/rc2.d/S99vcs start
  ```

  If VCS is configured correctly on each node, the console output resembles:
  See "Verifying the cluster" on page 160.

Modifying the VCS configuration

After the successful installation of VCS, you can modify the configuration of VCS using several methods. You can dynamically modify the configuration by using the command line, the Central Management Console, or Cluster Manager (the VCS Java GUI). Refer to the *Veritas Cluster Server User's Guide* for information on using the Central Management Console and the Java Console.

You can also edit the main.cf file directly. See the *Veritas Cluster Server User's Guide* for information on the structure of the main.cf file.

Configuring the ClusterService group

When you have successfully installed VCS, and verified that LLT, GAB, and VCS work correctly, you can create a service group to include the optional features including the Central Management Console, the VCS notification components, and the Global Cluster option. If you manually added VCS to your cluster systems, you must manually create the ClusterService group. Presented in this guide is a reference example of a system configured with a ClusterService group.

See the "Example main.cf, for clusters without the GCO option" on page 154.

Replacing a VCS demo license with a permanent license

When a VCS demonstration key license expires, you can replace it with a permanent license using the `vxlicinst(1)` program.

See "Checking licensing information on the system" on page 96.

Removing VCS filesets manually

You must remove the VCS filesets from each node in the cluster to uninstall VCS.

To manually remove VCS packages on a node

1. Shut down VCS on the local system using the `hastop(1m)` command.

   ```
   # hastop -local
   ```

2. Unconfigure the GAB and LLT utilities.

   ```
   # /sbin/gabconfig -U
   # /sbin/lltconfig -U
   ```

3. Unload the GAB driver:

   ```
   # /opt/VRTSgab/gabext -u
   ```

4. Unload the LLT driver:

   ```
   # strload -u -d /usr/lib/drivers/pse/llt
   ```

5. Before you can remove VRTSveki, you need remove these filesets if they exist: VRTSalloc, VRTSvxfs, VRTSvxvm.

   ```
   # installp -u VRTSalloc
   # installp -u VRTSvxfs
   # installp -u VRTSvxvm
   ```

6. Remove the VCS 5.0 filesets in the following order:

   ```
   # installp -u VRTScmccc
   # installp -u VRTScmcs
   # installp -u VRTSacclib
   # installp -u VRTScscm
   # installp -u VRTSweb
   # installp -u VRTScscw
   # installp -u VRTScssim
   # installp -u VRTScutil
   # installp -u VRTSjre15
   # installp -u VRTSvcs.doc
   # installp -u VRTSvcs.man
   # installp -u VRTSvcs.msg.en_US
   # installp -u VRTSvcsag
   # installp -u VRTSvcs
   # installp -u VRTSvxfen
   # installp -u VRTSgab
   # installp -u VRTSllt
   # installp -u VRTSveki
   # installp -u SYMClma
   # installp -u VRTSspt
   # installp -u VRTSat
   # installp -u VRTSsmf
   # installp -ug VRTSpbx
   # installp -u VRTSicsco
   # installp -u VRTSperl
   # installp -u VRTSvlic
   ```

Chapter 5

Setting up I/O fencing

This chapter contains the following topics:

About I/O fencing

I/O Fencing is a feature that prevents data corruption in the event of a communication breakdown in a cluster.

Note: Symantec strongly recommends that you use VCS I/O fencing to deter potential split brain scenarios in your cluster.

Preventing data corruption with I/O fencing

To provide high availability, the cluster must be capable of taking corrective action when a node fails. In this situation, VCS configures its components to reflect the altered membership.

Problems arise when the mechanism that detects the failure breaks down because symptoms appear identical to those of a failed node. For example, if a system in a two-node cluster fails, the system stops sending heartbeats over the private interconnects and the remaining node takes corrective action. However,

the failure of private interconnects (instead of the actual nodes) would present identical symptoms and cause each node to determine its peer has departed. This situation typically results in data corruption because both nodes attempt to take control of data storage in an uncoordinated manner.

In addition to a broken set of private networks, other scenarios can generate this situation. If a system is so busy that it appears to stop responding or “hang,” the other nodes could declare it as dead. This declaration may also occur for nodes using hardware that supports a “break” and “resume” function. When a node drops to PROM level with a break and subsequently resumes operations, the other nodes may declare the system dead even though the system later returns and begins write operations.

VCS uses a technology called I/O fencing to remove the risk associated with split brain. I/O fencing allows write access for members of the active cluster and blocks access to storage from non-members; even a node that is alive is unable to cause damage.

SCSI-3 persistent reservations

SCSI-3 Persistent Reservations (SCSI-3 PR) are required for I/O fencing and resolve the issues of using SCSI reservations in a clustered SAN environment. SCSI-3 PR enables access for multiple nodes to a device and simultaneously blocks access for other nodes.

SCSI-3 reservations are persistent across SCSI bus resets and support multiple paths from a host to a disk. In contrast, only one host can use SCSI-2 reservations with one path. If the need arises to block access to a device because of data integrity concerns, only one host and one path remain active. The requirements for larger clusters, with multiple nodes reading and writing to storage in a controlled manner, make SCSI-2 reservations obsolete.

SCSI-3 PR uses a concept of registration and reservation. Each system registers its own “key” with a SCSI-3 device. Multiple systems registering keys form a membership and establish a reservation, typically set to “Write Exclusive Registrants Only.” The WERO setting enables only registered systems to perform write operations. For a given disk, only one reservation can exist amidst numerous registrations.

With SCSI-3 PR technology, blocking write access is as simple as removing a registration from a device. Only registered members can “eject” the registration of another member. A member wishing to eject another member issues a “preempt and abort” command. Ejecting a node is final and atomic; an ejected node cannot eject another node. In VCS, a node registers the same key for all paths to the device. A single preempt and abort command ejects a node from all paths to the storage device.

I/O fencing components

Fencing in VCS involves coordinator disks and data disks. Each component has a unique purpose and uses different physical disk devices. The fencing driver is vxfen.

Data disks

Data disks are standard disk devices for data storage and are either physical disks or RAID Logical Units (LUNs). These disks must support SCSI-3 PR and are part of standard VxVM or CVM disk groups.

CVM is responsible for fencing data disks on a disk group basis. Disks added to a disk group are automatically fenced, as are new paths discovered to a device.

Coordinator disks

Coordinator disks are three standard disks or LUNs set aside for I/O fencing during cluster reconfiguration. Coordinator disks do not serve any other storage purpose in the VCS configuration. Users cannot store data on these disks or include the disks in a disk group for user data. The coordinator disks can be any three disks that support SCSI-3 PR. Coordinator disks cannot be special devices that array vendors use. For example, you cannot use EMC gatekeeper devices as coordinator disks.

Symantec recommends using the smallest possible LUNs for coordinator disks. Because coordinator disks do not store any data, cluster nodes need only register with them and do not need to reserve them.

These disks provide a lock mechanism to determine which nodes get to fence off data drives from other nodes. A node must eject a peer from the coordinator disks before it can fence the peer from the data drives. This concept of racing for control of the coordinator disks to gain the ability to fence data disks is key to understanding prevention of split brain through fencing.

Dynamic Multipathing devices with I/O fencing

DMP allows coordinator disks to take advantage of the path failover and the dynamic adding and removal capabilities of DMP. You can configure coordinator disks to use Veritas Volume Manager Dynamic Multipathing (DMP) feature.

For more information on using DMP, see the *Veritas Volume Manager Administrator's Guide*.

See "Updating /etc/vxfenmode file" on page 129

I/O fencing operations

I/O fencing, provided by the kernel-based fencing module (`vxfen`), performs identically on node failures and communications failures. When the fencing module on a node is informed of a change in cluster membership by the GAB module, it immediately begins the fencing operation. The node attempts to eject the key for departed nodes from the coordinator disks using the preempt and abort command. When the node successfully ejects the departed nodes from the coordinator disks, it ejects the departed nodes from the data disks. In a split brain scenario, both sides of the split would race for control of the coordinator disks. The side winning the majority of the coordinator disks wins the race and fences the loser. The loser then panics and reboots the system.

Preparing to configure I/O fencing

Make sure you performed the following tasks before configuring I/O fencing for VCS:

- Install the correct operating system.
- Install the VRTSvxfen fileset when you installed VCS.
- Install a version of Veritas Volume Manager (VxVM) that supports SCSI-3 persistent reservations (SCSI-3 PR).
  Refer to the installation guide accompanying the Storage Foundation product that you are using.

The shared storage that you add for use with VCS software must support SCSI-3 persistent reservations, a functionality that enables the use of I/O fencing.

Checking shared disks for I/O fencing

The shared storage for VCS must support SCSI-3 persistent reservations to enable I/O fencing. VCS involves two types of shared storage:

Data disks	Stores shared data
Coordinator disks	Act as a global lock during membership changes. Coordinator disks are small LUNs (typically three per cluster)

See “Setting up shared storage” on page 46.

Perform the following checks for I/O fencing disks:

- Identify three SCSI-3 PR compliant shared disks as coordinator disks.
  List the disks on each node and pick three disks as coordinator disks.

For example, execute the following commands to list the disks:

```
# lsdev -Cc disk
```

- Test the shared disks using the vxfentsthdw script.
  See "Testing the shared disks for SCSI-3" on page 123.

Testing the shared disks for SCSI-3

Use the vxfentsthdw utility to test the shared storage arrays support SCSI-3 persistent reservations and I/O fencing. Review the guidelines to run vxfentsthdw program, verify that the systems see the same disk, and proceed to test the disks. Make sure to test disks serving as coordinator disks.

See "Setting up coordinator disk groups" on page 127.

The vxfentsthdw utility has additional options suitable for testing many disks. Review the options for testing disk groups (`-g`) and disks listed in a file (`-f`) . You can also test disks without destroying data using the `-r` option.

Review these guidelines for using vxfentsthdw

- Verify the connection of the shared storage for data to two of the nodes on which you installed VCS.

  Warning: The tests overwrite and destroy data on the disks unless you use the `-r` option.

- The two nodes must have `ssh` (default) or `rsh` communication. If you use `rsh`, launch the vxfentsthdw utility with the `-n` option.
  See "Enabling communication between systems" on page 48.
  After completing the testing process, remove permissions for communication and restore public network connections.
  See "Removing permissions for communication" on page 132.
- To ensure both nodes are connected to the same disk during the testing, use the `vxfenadm -i` *`diskpath`* command to verify the disk serial number.
  See "Verifying the nodes see the same disk" on page 123.
- For A/P arrays, run the `vxfentsthdw` command only on secondary paths.
  See "Secondary paths are disabled in raw mode" on page 130.

Verifying the nodes see the same disk

To confirm whether a disk (or LUN) supports SCSI-3 persistent reservations, two nodes must simultaneously have access to the same disks. Because a shared disk is likely to have a different name on each node, check the serial number to verify the identity of the disk. Use the `vxfenadm` command with the `-i` option to verify that the same serial number for the LUN is returned on all paths to the LUN.

For example, an EMC disk is accessible by the /dev/rhdisk75 path on node A and the /dev/rhdisk76 path on node B.

From node A, enter:

```
# vxfenadm -i /dev/rhdisk75
Vendor id       : EMC
Product id      : SYMMETRIX
Revision        : 5567
Serial Number   : 42031000a
```

The same serial number information should appear when you enter the equivalent command on node B using the/dev/rhdisk76 path.

On a disk from another manufacturer, Hitachi Data Systems, the output is different and may resemble:

```
# vxfenadm -i /dev/rhdisk77
Vendor id       : HITACHI
Product id      : OPEN-3
Revision        : 0117
Serial Number   : 0401EB6F0002
```

Refer to the `vxfenadm(1M)` manual page.

Testing the disks using vxfentsthdw script

This procedure uses the /dev/rhdisk75 disk in the steps.

If the utility does not show a message stating a disk is ready, verification has failed. Failure of verification can be the result of an improperly configured disk array. It can also be caused by a bad disk.

If the failure is due to a bad disk, remove and replace it. The vxfentsthdw utility indicates a disk can be used for I/O fencing with a message resembling:

```
The disk /dev/rhdisk75 is ready to be configured for I/O Fencing on
node north
```

See "Adding or removing coordinator disks" on page 149.

To test disks using vxfentsthdw script

1. Make sure system-to-system communication is functioning properly.
   See "Enabling communication between systems" on page 48.
2. From one node, start the utility. Do one of the following:
   - If you use `ssh` for communication:
     ```
     # /opt/VRTSvcs/vxfen/bin/vxfentsthdw
     ```
   - If you use `rsh` for communication:
     ```
     # /opt/VRTSvcs/vxfen/bin/vxfentsthdw -n
     ```
3. After reviewing the overview and warning that the tests overwrite data on the disks, confirm to continue the process and enter the node names.
   ```
   ******** WARNING!!!!!!!! ********
   THIS UTILITY WILL DESTROY THE DATA ON THE DISK!!
   ```

```
Do you still want to continue : [y/n] (default: n) y
Enter the first node of the cluster: north
Enter the second node of the cluster: south
```

4 Enter the names of the disks you are checking. For each node, the same disk may be known by a different name:

```
Enter the disk name to be checked for SCSI-3 PGR on node north in
the format: /dev/rhdiskx
/dev/rhdisk75
Enter the disk name to be checked for SCSI-3 PGR on node south in
the format: /dev/rhdiskx
Make sure it's the same disk as seen by nodes north and south
/dev/rhdisk75
```

If the disk names are not identical, then the test terminates.

5 Review the output as the utility performs the checks and report its activities.

6 If a disk is ready for I/O fencing on each node, the utility reports success:

```
The disk is now ready to be configured for I/O Fencing on node
north
ALL tests on the disk /dev/rhdisk75 have PASSED
The disk is now ready to be configured for I/O Fencing on node
north
```

7 Run the vxfentsthdw utility for each disk you intend to verify.

Setting up I/O fencing for VCS

Tasks involved in setting up I/O fencing include:

- Initializing disks
- Setting up coordinator disk groups
- Stopping VCS on all nodes
- Configuring /etc/vxfendg disk group for I/O fencing
- Updating /etc/vxfenmode file
- Secondary paths are disabled in raw mode
- Starting I/O fencing
- Modifying VCS configuration to use I/O fencing
- Verifying I/O fencing configuration

Initializing disks

Install the driver and HBA card. Refer to the documentation from the vendor for instructions.

After you physically add shared disks to the nodes, you must initialize them as VxVM disks and verify that all the nodes see the same disk. Use the example procedure; see the *Veritas Volume Manager Administrator's Guide* for more information on adding and configuring disks.

To initialize disks

1. Make the new disks recognizable. On each node, enter:

   ```
   # lsdev -Cc disk
   ```

2. If the Array Support Library (ASL) for the array you are adding is not installed, obtain and install it on each node before proceeding. The ASL for the supported storage device you are adding is available from the disk array vendor or Symantec technical support.

3. Verify that the ASL for the disk array is installed on each of the nodes. Run the following command on each node and examine the output to verify the installation of ASL. The following output is a sample:

   ```
   # vxddladm listsupport all
   LIBNAME              VID
   ============================================================
   libvxCLARiiON.so     DGC
   libvxcscovrts.so     CSCOVRTS
   libvxemc.so          EMC
   ```

4. Scan all disk drives and their attributes, update the VxVM device list, and reconfigure DMP with the new devices. Type:

   ```
   # vxdisk scandisks
   ```

   See the Veritas Volume Manager documentation for details on adding and configuring disks.

5. Determine the VxVM name by which a disk drive (or LUN) is known.

   In the following example, a disk with the AIX device name /dev/rhdisk75 is identified by VxVM as EMC0_17:

   ```
   # vxdmpadm getdmpnode nodename=hdisk75
   NAME      STATE    ENCLR-TYPE   PATHS  ENBL   DSBL  ENCLR-NAME
   ============================================================
   EMC0_17  ENABLED  EMC          1      1      0     EMC0
   Notice that in the example command, the AIX device name for the
   block device was used.
   ```

   You can, as an option, run the command `vxdisk list` *`vxvm_device_name`* to see additional information about the disk, including the AIX device name. For example:

   ```
   # vxdisk list EMC0_17
   ```

6 To initialize the disks as VxVM disks, use one of the following methods:

- Use the interactive vxdiskadm utility to initialize the disks as VxVM disks.
  For more information see the *Veritas Volume Managers Administrator's Guide*.
- Use the `vxdisksetup` command to initialize a disk as a VxVM disk.
  `vxdisksetup -i device_name format=cdsdisk`
  The example specifies the CDS format:
  `# vxdisksetup -i EMC0_17 format=cdsdisk`
  Repeat this command for each disk you intend to use as a coordinator disk.

Setting up coordinator disk groups

I/O fencing requires coordinator disks that are configured in a disk group and accessible to each node in the cluster. These disks enables the vxfen driver to resolve potential split brain conditions and prevent data corruption. Make sure to meet the requirements for coordinator disks and then create the coordinator disk group.

Requirements for coordinator disks

After adding and initializing disks for use as coordinator disks, make sure coordinator disks meet the following requirements:

- You must have three coordinator disks.
- Each of the coordinator disks must use a physically separate disk or LUN.
- Each of the coordinator disks should exist on a different disk array, if possible.
- You must initialize each disk as a VxVM disk.
- The coordinator disks must support SCSI-3 persistent reservations.
  See "Testing the shared disks for SCSI-3" on page 123.
- The coordinator disks must exist in a disk group (for example, vxfencoorddg).
  See "Creating the coordinator disk group and setting the coordinator attribute" on page 128.
- Symantec recommends using hardware-based mirroring for coordinator disks.

Creating the coordinator disk group and setting the coordinator attribute

From one node, create a disk group named vxfencoorddg. This group must contain three disks or LUNs.

You must also set the coordinator attribute for the coordinator disk group. VxVM uses this attribute to prevent the reassignment of coordinator disks to other disk groups.

Note that if you create a coordinator disk group as a regular disk group, you can turn on the coordinator attribute in Volume Manager. You do this with a `vxdg set coordinator=on` command.

Refer to the *Veritas Volume Manager Administrator's Guide* for details on creating disk groups.

The example procedure assumes that the disks have the device names EMC0_12, EMC0_16, and EMCO_17.

To create the vxfencoorddg disk group

1 On any node, create the disk group by specifying the device name of the disks:

```
# vxdg -o coordinator=on init vxfencoorddg EMC0_12
```

2 Add the other two disks to the disk group:

```
# vxdg -g vxfencoorddg adddisk EMC0_16
# vxdg -g vxfencoorddg adddisk EMC0_17
```

Stopping VCS on all nodes

Before configuring the coordinator disk for use, you must stop VCS on all nodes.

To stop VCS on all nodes

- On one node, enter:

```
# hastop -all
```

Configuring /etc/vxfendg disk group for I/O fencing

After setting up the coordinator disk group, configure it for use.

To configure the disk group for fencing

1 Deport the disk group:

```
# vxdg deport vxfencoorddg
```

2 Import the disk group with the `-t` option to avoid automatically importing it when the nodes restart:

```
# vxdg -t import vxfencoorddg
```

3 Deport the disk group. Deporting the disk group prevents the coordinator disks from serving other purposes:

```
# vxdg deport vxfencoorddg
```

4 On all nodes, type:

```
# echo "vxfencoorddg" > /etc/vxfendg
```

Do not use spaces between the quotes in the “vxfencoorddg” text.

This command creates the /etc/vxfendg file, which includes the name of the coordinator disk group.

Based on the contents of the /etc/vxfendg and /etc/vxfenmode files, the rc script creates the /etc/vxfentab file for use by the vxfen driver when the system starts. The rc script also invokes the `vxfenconfig` command, which configures the vxfen driver to start and use the coordinator disks listed in /etc/vxfentab. The /etc/vxfentab file is a generated file; do not modify this file.

Example /etc/vxfentab file

The /etc/vxfentab file gets created when you start the I/O fencing driver.

See “Starting I/O fencing” on page 130.

An example of the /etc/vxfentab file on one node resembles:

- Raw disk

```
/dev/rhdisk75
/dev/rhdisk76
/dev/rhdisk77
```

- DMP disk

```
/dev/vx/rdmp/rhdisk75
/dev/vx/rdmp/rhdisk76
/dev/vx/rdmp/rhdisk77
```

In some cases you must remove disks from or add disks to an existing coordinator disk group.

See “Adding or removing coordinator disks” on page 149.

Updating /etc/vxfenmode file

You must update the /etc/vxfenmode file to operate in SCSI-3 mode. You can configure the vxfen module to use either DMP devices or the underlying raw character devices. Note that you must use the same SCSI-3 disk policy, either raw or dmp, on all the nodes.

To update /etc/vxfenmode file

- On all cluster nodes, depending on the SCSI-3 mechanism you have chosen, type:
  - For DMP configuration:
    `cp /etc/vxfen.d/vxfenmode_scsi3_dmp /etc/vxfenmode`
  - For raw device configuration:
    `cp /etc/vxfen.d/vxfenmode_scsi3_raw /etc/vxfenmode`

Secondary paths are disabled in raw mode

When you configure fencing in raw mode, fencing disables secondary paths for DMP. Fencing disables secondary paths for DMP because for certain A/P arrays, DMP opens secondary paths with an exclusive flag, and keeps all paths permanently open. In raw mode, however, fencing needs to open all paths and register keys down those paths.

Due to DMP's exclusive hold on the paths, the `vxfenconfig` command cannot open those paths. To avoid the issue of DMP holding open the secondary paths, fencing disables the secondary paths from DMP's perspective, which causes DMP to close the paths. This disabling of secondary paths is done using the `/etc/init.d/vxfen.rc` script.

During a cluster reconfiguration, if a primary path is not available for any reason, fencing tries to use secondary paths for the attempted operation. The path was disabled from DMP's perspective, but all SCSI-3 operations are performed to the path's raw interface.

When you attempt to run the `vxfentsthdw` command, remember that DMP has an exclusive hold on the path, so run it only on primary paths. Use the `vxdisk list` command to determine the primary path to a disk.

Starting I/O fencing

You now need to start I/O fencing on each node. VxFEN, the I/O fencing driver, may already be running, so you need to restart the driver for the new configuration to take effect.

To stop I/O fencing on a node

- Stop the I/O fencing driver.
  `# /etc/init.d/vxfen.rc stop`

To start I/O fencing on a node

- Start the I/O fencing driver.
  `# /etc/init.d/vxfen.rc start`

Modifying VCS configuration to use I/O fencing

After adding coordinator disks and configuring I/O fencing, add the UseFence = SCSI3 cluster attribute to the VCS configuration file, /etc/VRTSvcs/conf/config/main.cf. If you reset this attribute to UseFence = None, VCS does not make use of I/O fencing abilities while failing over service groups. However, I/O fencing needs to be disabled separately.

To modify VCS configuration to enable I/O fencing

1. Save the existing configuration:

   ```
   # haconf -dump -makero
   ```

2. Stop VCS on all nodes:

   ```
   # hastop -all
   ```

3. Make a backup copy of the main.cf file:

   ```
   # cd /etc/VRTSvcs/conf/config
   # cp main.cf main.orig
   ```

4. On one node, use vi or another text editor to edit the main.cf file. Modify the list of cluster attributes by adding the UseFence attribute and assigning its value of SCSI3.

   ```
   cluster rac_cluster101
   UserNames = { admin = "cDRpdxPmHpzS." }
   Administrators = { admin }
   HacliUserLevel = COMMANDROOT
   CounterInterval = 5
   UseFence = SCSI3
   )
   ```

5. Save and close the file.

6. Verify the syntax of the file /etc/VRTSvcs/conf/config/main.cf:

   ```
   # hacf -verify /etc/VRTSvcs/conf/config
   ```

7. Using rcp or another utility, copy the VCS configuration file from a node (for example, north) to the remaining cluster nodes.

   For example, on each remaining node, enter:

   ```
   # rcp north:/etc/VRTSvcs/conf/config/main.cf \
   /etc/VRTSvcs/conf/config
   ```

8. On each node enter the following sequence of commands. These commands brings up VCS processes:

   ```
   # /opt/VRTS/bin/hastart
   ```

Verifying I/O fencing configuration

Verify from the vxfenadm output that the SCSI-3 disk policy reflects the configuration in the /etc/vxfenmode file.

To verify I/O fencing configuration

- On one of the nodes, type:

```
# vxfenadm -d

I/O Fencing Cluster Information:
================================

Fencing Protocol Version: 201
Fencing Mode: SCSI3
Fencing SCSI3 Disk Policy: raw
Cluster Members:

    * 0 (north)
    1 (south)

RFSM State Information:
    node   0 in state  8 (running)
    node   1 in state  8 (running)
```

Removing permissions for communication

After completing the installation of VCS and verification of disk support for I/O fencing, if you used `rsh`, remove the temporary `rsh` access permissions you set for the nodes and restore the connections to the public network.

If the nodes use `ssh` for secure communications, and you temporarily removed the connections to the public network, restore the connections.

Additional I/O fencing information

Review additional information about I/O fencing, including an extended description of the vxfentsthdw command, vxfenadm command, and a description of I/O fencing behavior to protect data in certain scenarios.

vxfentsthdw options

Table 5-3 describes the methods the utility provides to test storage devices.

Table 5-3 vxfentsthdw options

vxfentsthdw option	Description	When to use
-n	Utility uses `rsh` for communication.	Use when `rsh` is used for communication.

Table 5-3 vxfentsthdw options

vxfentsthdw option	Description	When to use
-r	Non-destructive testing. Testing of the disks for SCSI-3 persistent reservations occurs in a non-destructive way; that is, there is only testing for reads, not writes. May be used with -m, -f, or -g options.	Use during non-destructive testing.
-t	Testing of the return value of `SCSI TEST UNIT (TUR)` command under SCSI-3 reservations. A warning is printed on failure of TUR testing.	When you want to perform TUR testing.
-d	Use DMP devices. May be used with -c or -g options.	By default, the script picks up the OS paths for disks in the disk group. If you want the script to use the DMP path, use the -d option.
-c	Utility tests the coordinator disk group prompting for systems and devices, and reporting success or failure.	For testing disks in coordinator disk group.
-m	Utility runs manually, in interactive mode, prompting for systems and devices, and reporting success or failure. May be used with -r and -t options. -m is the default option.	For testing a few disks or for sampling disks in larger arrays.
-f *filename*	Utility tests system/device combinations listed in a text file. May be used with -r and -t options.	For testing several disks.
-g *disk_group*	Utility tests all disk devices in a specified disk group. May be used with -r and -t options.	For testing many disks and arrays of disks. Disk groups may be temporarily created for testing purposes and destroyed (ungrouped) after testing.

Testing the coordinator disk group using vxfentsthdw -c

Use the vxfentsthdw utility to verify disks are configured to support I/O fencing. In this procedure, the vxfentsthdw utility tests the three disks one disk at a time from each node.

- From the node north, the disks are /dev/rhdisk75, /dev/rhdisk76, and /dev/rhdisk77.
- From the node south, the same disks are /dev/rhdisk80, /dev/rhdisk81, and /dev/rhdisk82.

Note: To test the coordinator disk group using the vxfentsthdw utility, the utility requires that the coordinator disk group, vxfencoorddg, be accessible from two nodes.

To test the coordinator disk group using vxfentsthdw -c

1. Use the `vxfentsthdw` command with the `-c` option. For example:

   ```
   # /opt/VRTSvcs/vxfen/bin/vxfentsthdw -c vxfencoorddg
   ```

2. Enter the nodes you are using to test the coordinator disks:

   ```
   Enter the first node of the cluster:
   north
   Enter the second node of the cluster:
   south
   ```

3. Review the output of the testing process for both nodes for all disks in the coordinator disk group. Each disk should display output that resembles:

   ```
   ALL tests on the disk /dev/rhdisk75 have PASSED.
   The disk is now ready to be configured for I/O Fencing on node
   north as a COORDINATOR DISK.

   ALL tests on the disk /dev/rhdisk80 have PASSED.
   The disk is now ready to be configured for I/O Fencing on node
   south as a COORDINATOR DISK.
   ```

4. After you test all disks in the disk group, the vxfencoorddg disk group is ready for use.

Removing and replacing a failed disk

If a disk in the coordinator disk group fails verification, remove the failed disk or LUN from the vxfencoorddg disk group, replace it with another, and retest the disk group.

If you need to replace a disk in an active coordinator disk group, refer to the troubleshooting procedure.

See "Adding or removing coordinator disks" on page 149.

To remove and replace a failed disk

1. Use the vxdiskadm utility to remove the failed disk from the disk group. Refer to the *Veritas Volume Manager Administrator's Guide*.
2. Add a new disk to the node, initialize it, and add it to the coordinator disk group.
   See "Initializing disks" on page 126.
   See "Setting up coordinator disk groups" on page 127.
3. Retest the disk group.

Using the -r option for non-destructive testing

To test disk devices containing data you want to preserve, you can use the -r option with the -m, -f, or -g options, which are described in the following sections. For example, to use the -m option and the -r option, you can run the utility by entering:

```
# /opt/VRTSvcs/vxfen/bin/vxfentsthdw -rm
```

When invoked with the -r option, the utility does not use tests that write to the disks. Therefore, it does not test the disks for all of the usual conditions of use.

Using the -m option

Review the procedure to test the shared disks. The utility uses the -m option.

See "Testing the shared disks for SCSI-3" on page 123.

Using the -f option

Use the -f option to test disks that are listed in a text file. For example, you can create a file to test two disks shared by systems north and south that might resemble:

```
north /dev/rhdisk75 south /dev/rhdisk77
north /dev/rhdisk76 south /dev/rhdisk78
```

Where the first disk is listed in the first line and is seen by north as /dev/rhdisk75 and by south as /dev/rhdisk77. The other disk, in the second line, is seen as /dev/rhdisk76 from north and /dev/rhdisk78 from south. Typically, the list of disks could be extensive.

Suppose you created the file named disks_blue. To test the disks, you would enter:

```
# /opt/VRTSvcs/vxfen/bin/vxfentsthdw -f disks_blue
```

The utility reports the test results one disk at a time, just as for the -m option.

You can redirect the test results to a text file. Precede the command with "yes" to acknowledge that the testing destroys any data on the disks to be tested.

Caution: Be advised that by redirecting the command's output to a file, a warning that the testing destroys data on the disks cannot be seen until the testing is done.

For example:

```
# yes | /opt/VRTSvcs/vxfen/bin/vxfentsthdw -f disks_blue >
blue_test.txt
```

Using the -g option

Use the -g option to test all disks within a disk group. For example, you create a temporary disk group consisting of all disks in a disk array and test the group.

Note: Do not import the test disk group as shared; that is, do not use the -s option.

The utility reports the test results one disk at a time. You can redirect the test results to a text file for review.

```
# /opt/VRTSvcs/vxfen/bin/vxfentsthdw -g red_disks_dg >
redtest.txt
```

After testing, destroy the disk group and put the disks into disk groups as you need.

Testing a disk with existing keys

If the utility detects that a coordinator disk has existing keys, you see a message that resembles:

```
There are Veritas I/O Fencing keys on the disk. Please make sure
that I/O Fencing is shut down on all nodes of the cluster before
continuing.

         ******** WARNING!!!!!!!! ********

THIS SCRIPT CAN ONLY BE USED IF THERE ARE NO OTHER ACTIVE NODES
IN THE CLUSTER!  VERIFY ALL OTHER NODES ARE POWERED OFF OR
INCAPABLE OF ACCESSING SHARED STORAGE.

If this is not the case, data corruption will result.

Do you still want to continue : [y/n] (default: n) y
```

The utility prompts you with a warning before proceeding. You may continue as long as I/O fencing is not yet configured.

About VXFEN tunable parameters

Table 5-4 describes tunable parameters for the VXFEN driver.

Table 5-4 VXFEN tunable parameters

vxfen Parameter	Description and Values: Default, Minimum, and Maximum
vxfen_debug_sz	Size of debug log in bytes ■ Values Default: 65536 Minimum: 65536 Maximum: 256K
vxfen_max_delay and vxfen_min_delay (See below.)	In the event of a network partition, the smaller cluster delays before racing for the coordinator disks. The time delayed allows a larger sub-cluster to win the race for the coordinator disks. The vxfen_max_delay and vxfen_min_delay parameters define the delay in seconds.
vxfen_max_delay	Specifies the maximum number of seconds that the smaller sub-cluster waits before racing with larger clusters for control of the coordinator disks. This value must be greater than the vxfen_min_delay value. ■ Values Default: 60 Minimum: 0 Maximum: 600
vxfen_min_delay	Specifies the minimum number of seconds that the smaller sub-cluster waits before racing with larger clusters for control of the coordinator disks. This value must be smaller than the vxfen_max_delay value. ■ Values Default: 1 Minimum: 0 Maximum: 600

See "Configuring the VXFEN parameters" on page 137.

Configuring the VXFEN parameters

For the parameter changes to take effect, reconfigure the VXFEN module.

1 Unconfigure the VXFEN module.

```
# /sbin/vxfenconfig -U
```

2 Start VCS.

```
# hastart
```

To change the VXFEN tunable parameter, use the chdev command, unload the driver, and reload the driver. Change the parameter on each cluster system. The example procedure changes the value of the vxfen_min_delay parameter.

To change the VXFEN tunable parameter

1 Check the status of the driver and start it if necessary:

```
# /etc/methods/vxfenext -status
```

To start the driver:

```
# /etc/init.d/vxfen.rc start
```

2 List the current value of the tunable parameter:

```
# lsattr -El vxfen
vxfen_min_delay=0
```

The current value is 1 (the default).

3 Enter:

```
# chdev -l vxfen -P -a vxfen_min_delay=30
```

4 Ensure that VCS is shut down. Unload and reload the driver after changing the value of the tunable:

```
# /etc/methods/vxfenext -stop
# /etc/methods/vxfenext -start
```

5 Perform the commands on each cluster system to change the parameter.

How I/O fencing works in different event scenarios

Table 5-5 describes how I/O fencing works to prevent data corruption in different failure event scenarios. For each event, corrective operator actions are indicated.

Table 5-5 I/O fencing scenarios

Event	Node A: What happens?	Node B: What happens?	Operator action
Both private networks fail.	Node A races for majority of coordinator disks. If Node A wins race for coordinator disks, Node A ejects Node B from the shared disks and continues.	Node B races for majority of coordinator disks. If Node B loses the race for the coordinator disks, Node B removes itself from the cluster.	When Node B is ejected from cluster, repair the private networks before attempting to bring Node B back.
Both private networks function again after event above.	Node A continues to work.	Node B has crashed. It cannot start the database since it is unable to write to the data disks.	Restart Node B after private networks are restored.
One private network fails.	Node A prints message about an IOFENCE on the console but continues.	Node B prints message about an IOFENCE on the console but continues.	Repair private network. After network is repaired, both nodes automatically use it.

Table 5-5 I/O fencing scenarios

Event	Node A: What happens?	Node B: What happens?	Operator action
Node A hangs.	Node A is extremely busy for some reason or is in the kernel debugger. When Node A is no longer hung or in the kernel debugger, any queued writes to the data disks fail because Node A is ejected. When Node A receives message from GAB about being ejected, it removes itself from the cluster.	Node B loses heartbeats with Node A, and races for a majority of coordinator disks. Node B wins race for coordinator disks and ejects Node A from shared data disks.	Verify private networks function and restart Node A.

Table 5-5 I/O fencing scenarios

Event	Node A: What happens?	Node B: What happens?	Operator action
Nodes A and B and private networks lose power. Coordinator and data disks retain power. Power returns to nodes and they restart, but private networks still have no power.	Node A restarts and I/O fencing driver (vxfen) detects Node B is registered with coordinator disks. The driver does not see Node B listed as member of cluster because private networks are down. This causes the I/O fencing device driver to prevent Node A from joining the cluster. Node A console displays: `Potentially a preexisting split brain. Dropping out of the cluster. Refer to the user documentation for steps required to clear preexisting split brain.`	Node B restarts and I/O fencing driver (vxfen) detects Node A is registered with coordinator disks. The driver does not see Node A listed as member of cluster because private networks are down. This causes the I/O fencing device driver to prevent Node B from joining the cluster. Node B console displays: `Potentially a preexisting split brain. Dropping out of the cluster. Refer to the user documentation for steps required to clear preexisting split brain.`	Resolve preexisting split brain condition. See "System panics to prevent potential data corruption" on page 146.

Table 5-5 I/O fencing scenarios

Event	Node A: What happens?	Node B: What happens?	Operator action
Node A crashes while Node B is down. Node B comes up and Node A is still down.	Node A is crashed.	Node B restarts and detects Node A is registered with the coordinator disks. The driver does not see Node A listed as member of the cluster. The I/O fencing device driver prints message on console: `Potentially a preexisting split brain. Dropping out of the cluster. Refer to the user documentation for steps required to clear preexisting split brain.`	Resolve preexisting split brain condition. See "System panics to prevent potential data corruption" on page 146.

Table 5-5 I/O fencing scenarios

Event	Node A: What happens?	Node B: What happens?	Operator action
The disk array containing two of the three coordinator disks is powered off.	Node A continues to operate as long as no nodes leave the cluster.	Node B continues to operate as long as no nodes leave the cluster.	
Node B leaves the cluster and the disk array is still powered off.	Node A races for a majority of coordinator disks. Node A fails because only one of three coordinator disks is available. Node A removes itself from the cluster.	Node B leaves the cluster.	Power on failed disk array and restart I/O fencing driver to enable Node A to register with all coordinator disks.

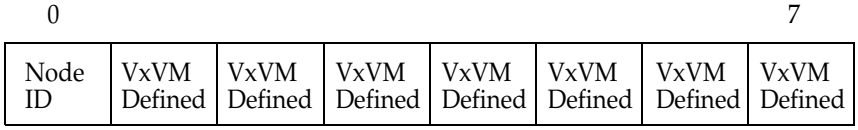
About the vxfenadm utility

Administrators can use the `vxfenadm` command to troubleshoot and test fencing configurations. The command's options for use by administrators are:

-g	read and display keys
-i	read SCSI inquiry information from device
-m	register with disks
-n	make a reservation with disks
-p	remove registrations made by other systems
-r	read reservations
-x	remove registrations

Registration key formatting

The key defined by VxVM associated with a disk group consists of seven bytes maximum. This key becomes unique among the systems when the VxVM prefixes it with the ID of the system. The key used for I/O fencing, therefore, consists of eight bytes.



The keys currently assigned to disks can be displayed by using the `vxfenadm` command.

For example, from the system with node ID 1, display the key for the disk /dev/rhdisk74 by entering:

```
# vxfenadm -g /dev/rhdisk74
Reading SCSI Registration Keys...
Device Name: /dev/rhdisk74
Total Number of Keys: 1
key[0]:
        Key Value [Numeric Format]: 65,45,45,45,45,45,45,45
        Key Value [Character Format]: A-------
```

The -g option of `vxfenadm` displays all eight bytes of a key value in two formats. In the numeric format, the first byte, representing the Node ID, contains the system ID plus 65. The remaining bytes contain the ASCII values of the letters of the key, in this case, "-------". In the next line, the node ID 0 is expressed as "A;" node ID 1 would be "B."

Troubleshooting I/O fencing

Headings indicate likely symptoms or procedures required for a solution.

Node is unable to join cluster while another node is being ejected

A cluster that is currently fencing out (ejecting) a node from the cluster prevents a new node from joining the cluster until the fencing operation is completed. The following are example messages that appear on the console for the new node:

```
...VCS FEN ERROR V-11-1-25 ... Unable to join running cluster
...VCS FEN ERROR V-11-1-25 ... since cluster is currently
fencing
...VCS FEN ERROR V-11-1-25 ... a node out of the cluster.

...VCS GAB.. Port b closed
```

If you see these messages when the new node is booting, the vxfen startup script on the node makes up to five attempts to join the cluster. If this is not sufficient to allow the node to join the cluster, restart the new node or attempt to restart vxfen driver with the command:

```
# /etc/init.d/vxfen.rc start
```

vxfentsthdw fails when SCSI TEST UNIT READY command fails

If you see a message resembling:

```
Issuing SCSI TEST UNIT READY to disk reserved by other node
FAILED.
Contact the storage provider to have the hardware configuration
fixed.
The disk array does not support returning success for a SCSI
TEST UNIT READY command when another host has the disk reserved
using SCSI-3 persistent reservations. This happens with Hitachi
Data Systems 99XX arrays if bit 186 of the system mode option is
not enabled.
```

Ignore “DISK OPERATION ERROR” message during restart

When you restart the systems after you install VCS and configure I/O fencing, you may safely ignore error messages resembling the following:

```
.
.
DCB47997   0506172404 T H hdisk13        DISK OPERATION ERROR
DCB47997   0506172404 T H hdisk13        DISK OPERATION ERROR
DCB47997   0506172404 T H hdisk17        DISK OPERATION ERROR
.
.
.
```

Removing existing keys from disks

Review the procedure to remove the registration and reservation keys created by another node from a disk.

To remove the registration and reservation keys from disk

1. Create a file to contain the access names of the disks:

   ```
   # vi /tmp/disklist
   ```

   For example:

   ```
   /dev/rhdisk74
   ```

2. Read the existing keys:

   ```
   # vxfenadm -g all -f /tmp/disklist
   ```

   The output from this command displays the key:

   ```
   Device Name: /dev/rhdisk74
   Total Number Of Keys: 1
   key[0]:
           Key Value [Numeric Format]:   65,49,45,45,45,45,45,45
           Key Value [Character Format]: A1------
   ```

3. If you know on which node the key was created, log in to that node and enter the following command:

   ```
   # vxfenadm -x -kA1 -f /tmp/disklist
   ```

   The key is removed.

4. If you do not know on which node the key was created, follow step 5 through step 7 to remove the key.

5. Register a second key "A2" temporarily with the disk:

   ```
   # vxfenadm -m -k A2 -f /tmp/disklist
   Registration completed for disk path /dev/rhdisk74
   ```

6. Remove the first key from the disk by preempting it with the second key:

   ```
   # vxfenadm -p -kA2 -f /tmp/disklist -vA1
   key: A2------ prempted the key: A1------ on disk
   /dev/rhdisk74
   ```

7. Remove the temporary key assigned in step 5.

   ```
   # vxfenadm -x -kA2 -f /tmp/disklist
   Deleted the key : [A2------] from device /dev/rhdisk74
   ```

   No registration keys exist for the disk.

System panics to prevent potential data corruption

When a node experiences a split brain condition and is ejected from the cluster, it panics and displays the following console message:

```
VXFEN:vxfen_plat_panic: Local cluster node ejected from cluster
to prevent potential data corruption.
```

How vxfen driver checks for pre-existing split brain condition

The vxfen driver functions to prevent an ejected node from rejoining the cluster after the failure of the private network links and before the private network links are repaired.

For example, suppose the cluster of system 1 and system 2 is functioning normally when the private network links are broken. Also suppose system 1 is the ejected system. When system 1 restarts before the private network links are restored, its membership configuration does not show system 2; however, when it attempts to register with the coordinator disks, it discovers system 2 is registered with them. Given this conflicting information about system 2, system 1 does not join the cluster and returns an error from `vxfenconfig` that resembles:

```
vxfenconfig: ERROR: There exists the potential for a preexisting
split-brain. The coordinator disks list no nodes which are in
the current membership. However, they also list nodes which are
not in the current membership.

I/O Fencing Disabled!
```

Also, the following information is displayed on the console:

```
<date> <system name> vxfen: WARNING: Potentially a preexisting
<date> <system name> split-brain.
<date> <system name> Dropping out of cluster.
<date> <system name> Refer to user documentation for steps
<date> <system name> required to clear preexisting split-brain.
<date> <system name>
<date> <system name> I/O Fencing DISABLED!
<date> <system name>
<date> <system name> gab: GAB:20032: Port b closed
```

However, the same error can occur when the private network links are working and both systems go down, system 1 restarts, and system 2 fails to come back up. From the view of the cluster from system 1, system 2 may still have the registrations on the coordinator disks.

Case 1: system 2 up, system 1 ejected (actual potential split brain)

Determine if system1 is up or not. If it is up and running, shut it down and repair the private network links to remove the split brain condition. restart system 1.

Case 2: system 2 down, system 1 ejected (apparent potential split brain)

1 Physically verify that system 2 is down.

2 Verify the systems currently registered with the coordinator disks. Use the following command:

```
# vxfenadm -g all -f /etc/vxfentab
```

The output of this command identifies the keys registered with the coordinator disks.

3 Clear the keys on the coordinator disks as well as the data disks using the command `/opt/VRTSvcs/rac/bin/vxfenclearpre`.

See "Clearing keys after split brain using vxfenclearpre command" on page 148.

4 Make any necessary repairs to system 2 and restart.

Clearing keys after split brain using vxfenclearpre command

When you have encountered a split brain condition, use the `vxfenclearpre` command to remove SCSI-3 registrations and reservations on the coordinator disks as well as on the data disks in all shared disk groups.

To clear keys after split brain

1 Shut down all other nodes in the cluster that have access to the shared storage. This prevents data corruption.

2 Start the script:

```
# cd /opt/VRTSvcs/vxfen/bin
# ./vxfenclearpre
```

3 Read the script's introduction and warning. Then, you can choose to let the script run.

```
Do you still want to continue: [y/n] (default : n) y
Cleaning up the coordinator disks...

Cleaning up the data disks for all shared disk groups...

Successfully removed SCSI-3 persistent registration and
reservations from the coordinator disks as well as the shared
data disks.

Reboot the server to proceed with normal cluster startup...
#
```

4 Restart all nodes in the cluster.

Adding or removing coordinator disks

Review the following information to:

- Replace coordinator disk in the coordinator disk group
- Destroy a coordinator disk group

Note: Adding or removing coordinator disks requires all services be shut down.

Note the following about the procedure:

- A coordinator disk group requires three disks/LUNs.
- When adding a disk, add the disk to the disk group `vxfencoorddg` and retest the group for support of SCSI-3 persistent reservations.
- You can destroy the coordinator disk group such that no registration keys remain on the disks. The disks can then be used elsewhere.

To remove and replace a disk in the coordinator disk group

1. Log in as superuser on one of the cluster nodes.
2. If VCS is running, shut it down:
   ```
   # hastop -all
   ```
3. Stop I/O fencing on all nodes:
   ```
   # /etc/init.d/vxfen.rc stop
   ```
   This removes any registration keys on the disks.
4. Import the coordinator disk group. The file /etc/vxfendg includes the name of the disk group (typically, `vxfencoorddg`) that contains the coordinator disks, so use the command:
   ```
   # vxdg -tfC import `cat /etc/vxfendg`
   ```
   where:
   -t specifies that the disk group is imported only until the node restarts.
   -f specifies that the import is to be done forcibly, which is necessary if one or more disks is not accessible.
   -C specifies that any import blocks are removed.
5. To remove disks from the disk group, use the VxVM disk administrator utility, `vxdiskadm`.
   You may also destroy the existing coordinator disk group. For example:
   ```
   # vxdg destroy vxfencoorddg
   ```
6. Add the new disk to the node, initialize it as a VxVM disk, and add it to the `vxfencoorddg` disk group.
   See "Creating the coordinator disk group and setting the coordinator attribute" on page 128.

7 Test the recreated disk group for SCSI-3 persistent reservations compliance.
See "Testing the coordinator disk group using vxfentsthdw -c" on page 134.

8 After replacing disks in a coordinator disk group, deport the disk group:

```
# vxdg deport `cat /etc/vxfendg`
```

9 On each node, start the I/O fencing driver:

```
# /etc/init.d/vxfen.rc start
```

10 If necessary, restart VCS on each node:

```
# hastart
```

Chapter 6

Verifying the VCS installation

This chapter contains the following topics:

About verifying the VCS installation

After successful installation, you can inspect the contents of the key configuration files that you have installed and modified during the process. These files reflect the configuration based on the information you supplied.

Verifying LLT and GAB configuration files

Low Latency Transport (LLT) and Group Membership and Atomic Broadcast (GAB) are VCS communication services. LLT requires /etc/llthosts and /etc/llttab files. GAB requires /etc/gabtab file.

/etc/llthosts

The file `llthosts(4)` is a database, containing one entry per system, that links the LLT system ID (in the first column) with the LLT host name. This file is identical on each node in the cluster.

For example, the file /etc/llthosts contains entries that resemble:

```
0   north
1   south
```

/etc/lltab

The file `lltab(1M)` contains information that is derived during installation and used by the utility `lltconfig(1M)`. After installation, this file lists the private network links that correspond to the specific system.

For example, the file /etc/lltab contains entries that resemble:

```
set-node north
set-cluster 2
link en1 /dev/en:1 - ether - -
link en2 /dev/en:2 - ether - -
```

The first line identifies the system. The second line identifies the cluster (that is, the cluster ID you entered during installation). The next two lines, beginning with the `link` command, identify the two network cards used by the LLT protocol.

Refer to the `lltab(4)` manual page for details about how the LLT configuration may be modified. The manual page describes the ordering of the directives in the `lltab` file.

/etc/gabtab

After you install VCS, the file /etc/gabtab contains a `gabconfig(1)` command that configures the GAB driver for use.

The file /etc/gabtab contains a line that resembles:

```
/sbin/gabconfig -c -nN
```

where the `-c` option configures the driver for use and `-nN` specifies that the cluster is not formed until at least *N* nodes are ready to form the cluster. By default, *N* is the number of nodes in the cluster.

Note: The use of the `-c -x` option for `/sbin/gabconfig` is not recommended. The Gigabit Ethernet controller does not support the use of `-c -x`.

Verifying the main.cf file

The VCS configuration file /etc/VRTSvcs/conf/config/main.cf is created during the installation process.

See "Example main.cf, for clusters without the GCO option" on page 154.

See "Example main.cf, for clusters with the GCO option" on page 156.

See "Example main.cf for a centrally managed cluster using Cluster Management Console" on page 156.

The main.cf file contains the minimum information that defines the cluster and its nodes. In addition, the file types.cf, which is listed in the include statement, defines the VCS bundled types for VCS resources. The file types.cf is also located in the directory /etc/VRTSvcs/conf/config after installation.

Note the following information about the VCS configuration file after installing and configuring VCS:

- The cluster definition includes the cluster information that you provided during the configuration. This includes the cluster name, cluster address, and the names of users and administrators of the cluster.

  Notice that the cluster has an attribute UserNames. The installvcs program creates a user "admin" whose password is encrypted; the word "password" is the default password.
- If you set up the optional I/O fencing feature for VCS, then the UseFence = SCSI3 attribute that you added is present.
- If you configured the cluster in secure mode, the main.cf includes the VxSS service group and "SecureClus = 1" cluster attribute.
- The installvcs program creates the ClusterService service group and includes the following:
  - The ClusterService service group includes the IP, NIC, and VRTSWebApp resources.
  - If you configured Cluster Management Console to manage this cluster locally, the main.cf includes the VRTSWebApp resource that includes AppName = cmc attribute.
  - If you configured Cluster Connector so that Cluster Management Console can centrally manage this cluster, the main.cf includes the CMC service group.

  The CMC service group includes the ClusterConnectorConfig and Process resources.
  - The service group also includes the notifier resource configuration, which is based on your input to installvcs program prompts about notification.
  - The installvcs program also creates a resource dependency tree.
  - If you installed VCS with the Global Cluster Option, the ClusterService service group contains an Application resource, wac (wide-area connector), whose attributes contain definitions for controlling the cluster in a Global Cluster environment.

Refer to the *Veritas Cluster Server User's Guide* for information about managing VCS global clusters.

Refer to the *Veritas Cluster Server User's Guide* and review the chapter on configuration concepts for descriptions and examples of main.cf and types.cf files for AIX systems.

Example main.cf, for clusters without the GCO option

The following sample main.cf is for a secure cluster that is managed locally by Cluster Management Console.

```
include "types.cf"

cluster vcs_cluster2 (
    UserNames = { admin = cDRpdxPmHpzS, smith = dKLhKJkHLh }
    ClusterAddress = "10.10.12.1"
    Administrators = { admin, smith }
    CounterInterval = 5
    SecureClus = 1
)

    system north (
        )

    system south (
        )

    group ClusterService (
        SystemList = { north = 0, south = 1 )
        UserStrGlobal = "LocalCluster@https://10.182.2.76:8443;"
        AutoStartList = { north, south )
        OnlineRetryLimit = 3
        OnlineRetryInterval = 120
        )

    IP webip (
        Device = en0
        Address = "10.10.12.1"
        NetMask = "255.255.240.0"
        )

    NIC csgnic (
        Device = en0
        )

    NotifierMngr ntfr (
        SnmpConsoles = { "saturn" = Error, "jupiter" = SevereError }
        SmtpServer = "smtp.example.com"
        SmtpRecipients =  { "ozzie@example.com" = Warning,
                            "harriet@example.com" = Error }
        )
```

```
VRTSWebApp VCSweb (
    Critical = 0
    AppName = cmc
    InstallDir = "/opt/VRTSweb/VERITAS"
    TimeForOnline = 5
    RestartLimit = 3
    )

    VCSweb requires webip
    ntfr requires csgnic
    webip requires csgnic

// resource dependency tree
    //
    // group ClusterService
    // {
    //      VRTSWebApp VCSweb
    //      {
    //          IP webip
    //          {
    //              NIC csgnic
    //          }
    //      }
    //      NotifierMngr ntfr
    //      {
    //          NIC csgnic
    //      }
    // }
group VxSS (
    SystemList = { north = 0, south = 1 }
    Parallel = 1
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

    Phantom phantom_vxss (
        )

    ProcessOnOnly vxatd (
        IgnoreArgs = 1
        PathName = "/opt/VRTSat/bin/vxatd"
        )


// resource dependency tree
    //
    // group VxSS
    // {
    // Phantom phantom_vxss
    // ProcessOnOnly vxatd
    // }
```

Example main.cf, for clusters with the GCO option

If you installed VCS with the Global Cluster option, note that the ClusterService group also contains the Application resource, wac, required to control the cluster in a Global Cluster environment.

```
.
.
group ClusterService (
    SystemList = { north = 0, south = 1 }
    UserStrGlobal = "LocalCluster@https://10.182.2.78:8443;"
    AutoStartList = { north, south }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

    Application wac (
        StartProgram = "/opt/VRTSvcs/bin/wacstart"
        StopProgram = "/opt/VRTSvcs/bin/wacstop"
        MonitorProcesses = { "/opt/VRTSvcs/bin/wac" }
        RestartLimit = 3
        )
.
.
```

Example main.cf for a centrally managed cluster using Cluster Management Console

```
include "types.cf"
include "ClusterConnectorConfigType.cf"

cluster vcs_cluster2 (
    UserNames = { "admin" = hqrJqlQnrMrrPzrLqo }
    Administrators = { "admin" }
    ClusterAddress = "10.10.12.1"
    CounterInterval = 5
    )

system north (
    )

system south (
    )

group ClusterService (
    SystemList = { north, south }
    AutoStartList = { north, south }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )
```

```
    IP webip (
        Device = en0
        Address = "10.10.12.1"
        NetMask = "255.255.240.0"
        )

    NIC csgnic (
        Device = en0
        )

    VRTSWebApp VCSweb (
        Critical = 0
        AppName = cmc
        InstallDir = "/opt/VRTSweb/VERITAS"
        TimeForOnline = 5
        RestartLimit = 3
        )

    VCSweb requires webip
    webip requires csgnic

group CMC (
    SystemList = { north, south }
    AutoStartList = { north, south }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

    ClusterConnectorConfig CMC_ClusterConfig (
        MSAddress = "mgmtserver1.symantecexample.com"
        MSPort = 14145
        ClusterId = "1145613636"
        ClusterType = "vcs"
        ClusterPort = 14141
        VCSLoggingLevel = "TAG_A"
        Logging = "/opt/VRTScmccc/conf/cc_logging.properties"
        ClusterConnectorVersion = "5.0.1000.0"
    )

    Process CMC_ClusterConnector (
        PathName = "/bin/sh"
        Arguments = "/opt/VRTScmccc/bin/cluster_connector.sh"
    )

    CMC_ClusterConnector requires CMC_ClusterConfig
```

Verifying LLT, GAB, and cluster operation

Before attempting to verify the operation of LLT, GAB, or the cluster, you must:

- Log in to any node in the cluster as superuser.

- Place the VCS command directory in your PATH variable:

  # export PATH=$PATH:/usr/sbin:/sbin:/opt/VRTS/bin:/opt/VRTSvcs/bin

Verifying LLT

Use the lltstat command to verify that links are active for LLT. This command returns information about the links for LLT for the node on which you typed the command. Refer to the lltstat(1M) manual page for more information.

Using lltstat -n

In the following example, lltstat -n is typed on each node in the cluster:

Node 1

```
# lltstat -n
```

Output resembles:

```
LLT node information:
    Node           State      Links
    *0 north       OPEN       2
     1 south       OPEN       2
```

Node 2

```
# lltstat -n
```

Output resembles:

```
LLT node information:
    Node           State      Links
     0 north       OPEN       2
    *1 south       OPEN       2
```

Note that each node has two links and that each node is in the OPEN state. The asterisk (*) denotes the node on which you typed the command.

Using lltstat -nvv

With LLT configured correctly, the output of lltstat -n shows all the nodes in the cluster and two links for each node. If the output shows otherwise, you can use the verbose option of lltstat.

For example, type lltstat -nvv | more on a node to view additional information about LLT. In the following example, lltstat -nvv | more is typed on node north in a two-node cluster:

```
# lltstat -nvv | more
```

Output resembles:

```
Node       State      Link    Status     Address
*0 north   OPEN
                      en1 UP         08:00:20:93:0E:34
```

```
                        en2 UP          08:00:20:93:0E:34
1 south     OPEN
                        en1 UP          08:00:20:8F:D1:F2
                        en2 DOWN
2               CONNWAIT
                        en1     DOWN
                        en2     DOWN
3           CONNWAIT
                        en1     DOWN
                        en2     DOWN
.
.
.

31          CONNWAIT
                        en1      DOWN
                        /dev/en:2  DOWN
```

Note that the output lists 32 nodes. It reports on the two nodes in the cluster, north and south, plus non-existent nodes. For each correctly configured node, the information should show a state of OPEN, a status for each link of UP, and an address for each link. However, the output in the example shows that for the node south the private network connection is possibly broken or the information in the /etc/llttab file may be incorrect.

To obtain information about the ports open for LLT, type `lltstat -p` on any node. In the following example, `lltstat -p` is typed on one node in a two-node cluster:

Node 1

```
# lltstat -p
```

Output resembles:

```
LLT port information:
    Port    Usage       Cookie
    0       gab         0x0
        opens:          0 2 3 4 5 6 7 8 9 10 11 … 28 29 30 31
        connects:       0 1
    7       gab         0x7
        opens:          0 2 3 4 5 6 7 8 9 10 11 … 28 29 30 31
        connects:       0 1
    31      gab         0x1F
        opens:          0 2 3 4 5 6 7 8 9 10 11 … 28 29 30 31
        connects:       0 1
```

Verifying GAB

To verify that GAB is operating, type the following command on each node:

```
# /sbin/gabconfig -a
```

If GAB is operating, the following GAB port membership information is returned:

```
GAB Port Memberships
===================================
Port a gen a36e0003 membership 01
Port h gen fd570002 membership 01
```

Port a indicates that GAB is communicating, gen a36e0003 is a randomly generated number, and membership 01 indicates that nodes 0 and 1 are connected.

Port h indicates that VCS is started, gen fd570002 is a randomly generated number, and membership 01 indicates that nodes 0 and 1 are both running VCS.

If GAB is not operating, the command does not return any GAB port membership information:

```
GAB Port Memberships
===================================
```

If only one network is connected, the command returns the following GAB port membership information:

```
GAB Port Memberships
===================================
Port a gen a36e0003 membership 01
Port a gen a36e0003 jeopardy    1
Port h gen fd570002 membership 01
Port h gen fd570002 jeopardy    1
```

For more information on GAB, refer to the *Veritas Cluster Server User's Guide*.

Verifying the cluster

To verify that the cluster is operating, type the following command:

```
# hastatus -summary
```

The output resembles:

```
-- SYSTEM STATE
-- System               State              Frozen

A  north                RUNNING            0
A  south                RUNNING            0

-- GROUP STATE
-- Group           System     Probed  AutoDisabled   State

B  ClusterService  north      Y       N              ONLINE
B  ClusterService  south      Y       N              OFFLINE
```

Note the system state. If the value is RUNNING, VCS is successfully installed and running. The group state lists the ClusterService group, which is ONLINE on

north and OFFLINE on south. Refer to the `hastatus(1M)` manual page. In the *Veritas Cluster Server User's Guide*, look for a description of system states and the transitions between them.

hasys -display

On one of the nodes, use the `hasys(1M)` command:

```
# /opt/VRTSvcs/bin/hasys -display
```

On each node, the output should be similar. For more information on the `hasys -display` command, refer to the `hasys(1M)` manual page. Also refer to the *Veritas Cluster Server User's Guide* for information about administering VCS from the command-line.

The example shows the output when the `hasys -display` command is run on the node north; the list continues with similar information for south (not shown) and any other nodes in the cluster:

```
#System  Attribute          Value

north    AgentsStopped      0

north    AvailableCapacity  100

north    CPUUsage           0

north    CPUUsageMonitoring Enabled 0 ActionThreshold 0
                            ActionTimeLimit 0 Action NONE
                            NotifyThreshold 0 NotifyTimeLimit 0

north    Capacity           100

north    ConfigBlockCount   117

north    ConfigCheckSum     10844

north    ConfigDiskState    CURRENT

north    ConfigFile         /etc/VRTSvcs/conf/config

north    ConfigInfoCnt      0

north    ConfigModDate      Fri May 26 17:22:48 2006

north    ConnectorState     Down

north    CurrentLimits

north    DiskHbStatus

north    DynamicLoad        0
```

```
north    EngineRestarted    0
north    EngineVersion      5.0.00.0
north    Frozen             0
north    GUIIPAddr
north    LLTNodeId          0
north    LicenseType        DEMO
north    Limits
north    LinkHbStatus       en1 UP en2 UP
north    LoadTimeCounter    0
north    LoadTimeThreshold  600
north    LoadWarningLevel   80
north    NoAutoDisable      0
north    NodeId             0
north    OnGrpCnt           1
north    ShutdownTimeout    120
north    SourceFile         ./main.cf
north    SysInfo            Aix:north,5,2,00023BDA4C00
north    SysName            north
north    SysState           RUNNING
north    SystemLocation
north    SystemOwner
north    TFrozen            0
north    TRSE               0
north    UpDownState        Up
north    UserInt            0
north    UserStr
north    VCSFeatures        DR
north    VCSMode            VCS
```

Accessing the Veritas Cluster Management Console

The VCS web-based Cluster Management Console enables you to monitor the cluster from any workstation on the public network. Supported browsers are Netscape Navigator 4.0 or later, or Internet Explorer 4.0 or later.

When VCS starts running in the cluster and the ClusterService Group comes up, the Web Console server starts.

To access the Web Console

1. From the browser, navigate to the Web Console by entering:
   `http://hostname:8443/cmc`
   or
   `http://hostname:8181/cmc`
   Where hostname is the system name or IP address.
   For example:
   `http://10.10.12.1:8443/cmc`
   The IP address is the “Cluster virtual IP address” configured into the ClusterService Group.
2. On the Login screen, enter a valid user name and password. By default, the administrator of a new installation can log in as “admin” and use “password” as a password. For security, change your password at your earliest convenience.
3. Click Login to enter the Cluster Summary view.

Accessing the VCS documentation

If you had chosen to install the optional fileset VRTSvcsdc, then the directory /opt/VRTS/docs contains the documentation for VCS in Portable Document Format (PDF). The directory contains the following documents:

- vcs_users.pdf, *Veritas Cluster Server User’s Guide*
- vcs_bundled_agents.pdf, *Veritas Cluster Server Bundled Agents Reference Guide*
- vcs_agent_dev.pdf, *Veritas Cluster Server Agent Developer’s Guide*

Chapter 7

Upgrading to VCS 5.0

This chapter includes the following topics:

About upgrading to VCS 5.0

VCS 5.0 supports the following upgrade paths:

From	To
VCS 3.5 MP2	VCS 5.0
VCS 4.0 MP3	VCS 5.0

For CommandCentral Availability upgrade from 4.1 MP1, see:
"Upgrading from CommandCentral Availability 4.1 MP1" on page 174.

Upgrading VCS using installvcs program

If you are currently running a VCS cluster, including a VCS global cluster, you can run the installer to upgrade to VCS 5.0. The program detects the current configuration and prompts you to indicate whether you want to upgrade. While the installer is not able to verify the validity of the existing configuration, it is able to run extensive upgrade requirement checks before proceeding.

See "About the VCS installation program" on page 58.

If you want to upgrade from an earlier version of VCS to VCS 5.0 and use the Global Cluster option, you must first upgrade to standard VCS 5.0. After adding a license for the Global Cluster option, you can run the gcoconfig wizard. Note that the Global Cluster option requires a VCS HA/DR license. See the *Veritas Cluster Server User's Guide* for instructions.

Upgrading VCS to 5.0

When you run `installvcs` on cluster systems that currently runs VCS 3.5 MP2 and 4.0 MP3, the program guides you through an upgrade procedure. The upgrade example demonstrates how to upgrade VCS 4.0 to VCS 5.0 on nodes north and south using installvcs program.

Upgrade tasks include:

Removing deprecated resource types

With VCS 5.0, certain resource type definitions are no longer used. Before you start the upgrade process, you must remove the resources of the deprecated resource types from your cluster configuration. The list of resource types that are not used in VCS 5.0 are:

- `ServiceGroupHB`
- `ClusterMonitorConfig`

Note: The `ClusterConnectorConfig` resource type has replaced the `ClusterMonitorConfig` resource type.

If you are using the resource type `ServiceGroupHB`, Symantec recommends the use of I/O fencing.

Perform the following steps to remove the deprecated resource types.

To remove the deprecated resource types

1 Save the VCS configuration and stop the VCS engine.

```
# haconf -dump -makero
# hastop -all -force
```

2 Back up the configuration file, `main.cf` to a location on the cluster node.

3 Edit the `main.cf` located under `/etc/VRTSvcs/conf/config`.

   a Remove the resource of the deprecated resource types.
   You must modify the resource dependencies to ensure that the configuration works properly.

   b Save the `main.cf`.

4 Verify the configuration.

```
# cd /etc/VRTSvcs/conf/config
# hacf -verify config
```

5 Start VCS on the local node.

6 Start VCS on other nodes.

VCS 5.0 does not support `gabdiskhb`. So, the `installvcs` program removes the `gabdiskhb` entry from the `/etc/gabtab` file.

Note: Make sure you start VCS on the local node before starting on the other nodes. This ensures that `HAD` reads the configuration from the local node and updates it on the remaning nodes.

Starting the upgrade

Start the installvcs program to automatically upgrade the cluster nodes.

To start the upgrade

1 Log in as superuser.

2 Mount the software disc.
See “Mounting the product disc” on page 51.

3 Ensure that HAD is running.

4 On the node where the disk was mounted, browse to the `cluster_server` directory and start the installvcs program:

```
# ./installvcs
```

See “Starting the software installation” on page 62.

5 After viewing a copyright notice, review the report after the program examines the configuration files and discovers the existing cluster configuration (including the `ClusterService` group, if it is defined):

```
VCS configuration files exist on this system with the following
information:

    Cluster Name: vcs_cluster2
    Cluster ID Number: 7
    Systems: north south
    Service Groups: ClusterService XYZ_group

No checks have been made to ensure the validity of the
configuration.
VCS version 4.0.3.0 is installed on this system
```

6 To upgrade to VCS 5.0, press **Enter**.

```
Do you want to upgrade to version 5.0 on these systems using the
current configuration? [y,n,q,?] (y) y
```

Checking upgrade requirements

The installer program verifies that you systems meet the requirements for upgrading.

To check upgrade requirements

1 Review the output as the program verifies that the upgrade can proceed on the systems.

The installvcs program checks the operating system level and system-to-system communication. It also creates logs for the VCS update.

```
installvcs requires that ssh commands used between systems
execute without prompting for passwords or confirmations.  If
installvcs hangs or asks for a login password or hangs, stop
installvcs and run it again with the ssh configured for
passwordless logins, or configure rsh and use the -rsh option.

Checking ssh communication with north.....................AIX 5.3
Checking VCS installation on north..................... 4.0.3.0
Checking VCS installation on south..................... 4.0.3.0
```

2 Review the output as the installer checks the licenses that are currently in place on the cluster nodes. The installer also prompts to add additional license keys:

```
Checking system licensing

Installing licensing filesets
VCS license registered on north
```

```
Do you want to enter another license key for north? [y,n,q](n) n
VCS license registered on south

Do you want to enter another license key for south? [y,n,q](n) n
```

Removing VCS filesets from previous versions and installing VCS 5.0 filesets

The installer program is ready to remove the filesets from VCS version 4.1 and install the 5.0 filesets on each node after verifying the requirements.

To remove VCS filesets from previous versions and add 5.0 filesets

1 Review the output as the installer checks for existing filesets.

```
Checking installed filesets on north
Checking installed filesets on south
```

2 Specify the filesets to be installed on the cluster systems.

```
Additional filesets are typically installed to simplify future
upgrades.
1)  All Veritas Cluster Server filesets - 633 MB required
2)  Storage Foundation Enterprise HA filesets - 1114 MB required
Select the filesets to be installed on all systems? [1-2,q,?] 2
```

3 The installer lists the filesets that will be installed or upgraded. Press **Enter** at the prompt.

```
installvcs will upgrade or install the following VCS filesets:
VRTSvlic         Veritas Licensing
VRTSperl.rte     Veritas Perl 5.8.6 Redistribution
VRTSicsco        Symantec Common Infrastructure
VRTSpbx          Symantec Private Branch Exchange
VRTSsmf          Symantec Service Management Framework
VRTSat           Symantec Product Authentication Service
VRTSspt          Veritas Software Support Tools
SYMClma          Symantec License Inventory Agent
VRTSveki         Veritas Kernel Interface
VRTSllt.rte      Veritas Low Latency Transport
VRTSgab.rte      Veritas Group Membership and Atomic Broadcast
VRTSvxfen.rte    Veritas I/O Fencing
VRTSvcs.rte      Veritas Cluster Server
VRTSvcsag.rte    Veritas Cluster Server Bundled Agents
VRTSvcs.msg.en_US Veritas Cluster Server Message Catalogs
VRTSvcs.man      Veritas Cluster Server Man Pages
VRTSvcs.doc      Veritas Cluster Server Documentation
VRTSjre15.rte    Veritas Java Runtime Environment Redistribution
VRTScutil.rte    Veritas Cluster Utilities
VRTScssim.rte    Veritas Cluster Server Simulator
VRTScscw.rte     Veritas Cluster Server Configuration Wizards
VRTSweb.rte      Veritas Java Web Server
VRTScscm.rte     Veritas Cluster Server Cluster Manager
VRTSacclib.rte   Veritas ACC Library
```

```
VRTScmcs.rte     Veritas Cluster Management Console (Single
                Cluster Mode)
VRTScmccc.rte    Veritas Cluster Management Console Cluster
                Connector
Press [Enter] to continue:
```

4 The installer is now ready to upgrade VCS. Press **Enter** at the prompt.

```
installvcs is now ready to upgrade VCS.
All VCS processes that are currently running must be stopped.

Are you sure you want to upgrade VCS? [y,n,q] (y) y
Updating gabtab on north..................................... Done

installvcs must now make configuration updates and stop the
cluster before upgrading VCS filesets

Are you ready to begin the Veritas Cluster Server upgrade at
this time? [y,n,q] (y) y
```

5 View the output as the program backs up the types.cf and main.cf and freezes the service group configured in the cluster.

```
Backing up types.cf and main.cf.............................. Done
Freezing group XYZ_group..................................... Done
Updating types.cf file ...................................... Done
Updating gabtab on north..................................... Done
Updating gabtab on south..................................... Done
```

6 The program attempts to stop VCS and uninstall the filesets. Progress indicators show the status of these tasks.

7 The program now attempts to install VCS 5.0 filesets. A progress indicator shows the status of the task.

8 The program starts updating the `main.cf` configuration file on all nodes in the cluster.

Starting VCS

After the installvcs program upgrades the nodes, you can proceed to start VCS using the installvcs program.

To start VCS

1 The program prompts you to start VCS.

```
Do you want to start Veritas Cluster Server processes now?
[y,n,q] (y)
```

- If you have an NFS resource configured in the cluster, enter **n** and do not start VCS here. Edit the `main.cf` file to include details about the NFSRestart agent.

Refer to the *Veritas Cluster Server Bundled Agents Reference Guide* for details about editing the `main.cf` file. After editing this file, attempt to start VCS.

- If you have configured resources for Oracle, Sybase, or DB2 databases, enter **n** and do not start VCS here.
  Refer to the respective Enterprise agent documentation for upgrade information. After upgrading the agents, attempt to start VCS.
- If you have none of the above resources configured on the node, enter **y** to start VCS.
  ```
  Starting VCS: 0%
  Starting VCS: 100%
  ```

2 The program attempts to unfreeze the service group and online the ClusterService group.

```
Unfreezing NFSGroup..................................... Done
Unfreezing myshare...................................... Done
Unfreezing testgrp...................................... Done
Onlining ClusterService Group on north.................. Done
```

Completing the upgrade

After starting the cluster server processes, the upgrade is complete.

To complete upgrade

1 Note the locations of the summary and log files that the program creates.

```
Upgrade log files and summary file are saved at:

        /opt/VRTS/install/logs/installvcs-unique string/
```

2 Other files specific to the installer program are also created in the `/opt/VRTS/install/logs/installvcs-unique string/` directory.

3 Verify that the cluster is operating properly after the upgrade.
See "Verifying the VCS installation" on page 151.

Updating the configuration file

If you are upgrading from VCS 3.5 MP2 or 4.0 MP3, to VCS 5.0:

1 Freeze the Service Groups.

2 Stop VCS.

3 For upgrading from VCS 3.5 MP2 to VCS 5.0, edit the `types.cf` file:

- For a DiskGroup type definition, add this attribute:
  `temp str tempUseFence = INVALID`

- For a Mount type definition, modify the value of the SnapUmount attribute:

  ```
  int SnapUmount = 0
  ```

- For a MultiNICA type definition:
  - Modify the HandshakeInterval attribute:

    ```
    int HandshakeInterval = 1
    ```

  - Add this attribute:

    ```
    temp Boolean FailoverInProgress = 0
    ```

- For a NotifierMngr type definition, modify the value of the MessagesQueue attribute:

  ```
  int MessagesQueue = 30
  ```

For upgrading from VCS 4.0 MP3 to VCS 5.0, edit the `types.cf` file:

- For a Mount type definition, modify the value of the SnapUmount attribute:

  ```
  int SnapUmount = 0
  ```

4 Start VCS.

5 Unfreeeze the Service Groups.

Using the halogin command for native OS accounts with VCS

VCS has deprecated the AllowNativeCliUsers attribute. To use native OS accounts with VCS, use the `halogin` command. Once you run `halogin`, VCS encrypts and stores your VCS credentials in the your home directory for a specific time period. After running `halogin`, you do not need to authenticate yourself every time you run a VCS command. In secure clusters, the command also sets up a trust relationship and retrieves a certificate from an authentication broker.

Follow the instructions below if you used the AllowNativeCli users attribute.

To set up VCS authentication for clusters running in secure mode

Ensure that each native user running VCS commands must have a home directory on the system from which the user runs VCS commands.

1 Create VCS user accounts for all users and assign privileges to these users.

2 If you run VCS commands from a remote host, set these environment variables:

- VCS_HOST—Name of the VCS node on which you run commands. You may specify the virtual IP address associated with the cluster.
- VCS_DOMAIN—Name of the VxSS domain to which the user belongs.

- VCS_DOMAINTYPE—Type of VxSS domain: `unixpwd`, `nt`, `nis`, `nisplus`, or `vx`.

3 Run the `halogin` command:

```
# halogin vcsusername password
```

Perform steps 2 and 3 for each VCS user.

To set up VCS authentication for clusters not running in secure mode

Ensure that each native user running VCS commands must have a home directory on the system from which the user runs VCS commands.

1 Create VCS user accounts for all users and assign privileges to these users.

2 For each VCS user, run the `halogin` command:

```
# halogin vcsusername password
```

Upgrading VCS in a secure environment

In a secure environment, run the installvcs program on each node to upgrade a cluster to VCS 5.0. On the first node, the program updates the configuration and stops the cluster before upgrading the system. On the other nodes, it uninstalls the previous version and installs VCS 5.0. After the last node is upgraded and started, the upgrade is complete.

Upgrading to the VCS 5.0 Java Console

When you upgrade to VCS release 5.0, you must also upgrade the Java Console (GUI) that you installed on a separate system. VCS 5.0 supports earlier versions of the Java Console, but earlier VCS versions cannot support later versions of Java Console.

Note: The VCS 5.0 Java Console requires JRE version 1.5. If necessary, you can add it when you add the Java Console fileset.

Use one of the following applicable procedures:

To upgrade Java console on AIX

1 Log in as superuser on the node where you intend to install the fileset.

2 Remove the GUI from the previous installation.
For example, to remove a GUI installed with VCS 3.5, enter:

```
# installp -u VRTScscm
```

3 Install the VCS Java console.
See “Installing the Java Console on AIX” on page 76.

To upgrade Java console on Windows Systems

1 Remove the Java-based cluster manager from previous installations.
- From the Control Panel, double-click **Add/Remove Programs**.
- Select **Symantec Cluster Manager**.
- Click **Add/Remove**.
- Follow the uninstall wizard instructions.

2 Add the new Java-based Cluster Manager.
See “Installing the Java Console on a Windows system” on page 77.

Upgrading from CommandCentral Availability 4.1 MP1

You can upgrade CommandCentral Availability 4.1 MP1 to the Cluster Management Console configured in multi-cluster mode.

This upgrade requires that you:

- Upgrade the management server in CommandCentral Availability to the management server in the Cluster Management Console.
  You must perform this upgrade on a standalone server that is outside of all clusters.
- Upgrade cluster monitor, the cluster communications agent in CommandCentral Availability, to cluster connector, the cluster communications agent in the Cluster Management Console.
  You must perform this upgrade on each cluster that uses cluster monitor.

Upgrade order

The management server in the Cluster Management Console cannot communicate with cluster monitor. To minimize the amount of management downtime and to maintain cluster histories in the database, Symantec recommends that you upgrade the management server first.

The upgraded management server can immediately begin to monitor and manage any direct-connection clusters in your enterprise. It cannot monitor or manage any clusters connected through cluster monitor until you upgrade each cluster monitor to cluster connector. From the time that you finish upgrading the management server until you upgrade cluster monitor, the status of the associated cluster is UNKNOWN.

Upgrading the management server on Solaris

You must perform this upgrade on a standalone server system that is outside all clusters and available on the local network. The system must currently host the CommandCentral Availability management server (predecesor to the Cluster Management Console management server). Symantec Product Authentication Service, a shared component, is installed during management server upgrade. If an older version of the service is installed, it is upgraded to the latest version.

This procedure follows a script of a successful upgrade. If at any step you experience a result other than the expected result that is documented here, you can click “n” to re-enter information. If you continue to have problems, click “q” to quit the installation and then verify the installation prerequisites.

To upgrade the management server on Solaris

1. Insert the disc into the drive on the local system. At the command prompt, type the following command to run the setup program:

   ```
   ./installer -rsh
   ```

   The setup program presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2. Enter **i** to specify a task.

   ```
   Enter a Task: [I,C,L,P,U,D,Q,?] i
   ```

   The setup program displays another menu that lists products that are available for installation.

3. Select the menu number that corresponds to Veritas Cluster Management Console.

   ```
   Select a product to install: [1-13,b,q]
   ```

   The setup program presents a description of the product.

4. Enter **1** to select a product component.

   ```
   Enter '1' to install the management server, '2' to install the
   cluster
   connector: [1-2,q] (1) 1
   ```

   The setup program presents a message stating that it will install the management server.

5. Enter **y** to verify that the information up to this point is correct.

   ```
   Is this information correct? [y,n,q] (y)
   ```

   The setup program performs an initial system check of the local system and checks for installed packages on the local system. If these checks are satisfactory, the setup program lists the packages to be installed.

   ```
   Storage Foundation and High Availability Solutions 5.0 installer
   will upgrade or install the following Cluster Management Console
   packages:
   VRTSat       Symantec Product Authentication Service
   VRTSperl     Veritas Perl 5.8.8 Redistribution
   ```

```
VRTSjre15    Veritas Java Runtime Environment Redistribution
VRTSweb      Veritas Java Web Server
VRTSdbms3    Symantec Shared DBMS
VRTScmcm     Veritas Cluster Management Console for multiple
cluster environments
VRTScmcdc    User Documentation for Veritas Cluster Management
Console
Press [Return] to continue:
```

6 Press Enter.

The setup program displays the following message:

```
Installer is now ready to upgrade Cluster Management Console.
All Cluster Management Console processes that are currently
running must be stopped.
```

7 Enter **y** to confirm that you want to upgrade the Cluster Management Console.

```
Are you sure you want to upgrade Cluster Management Console?
[y,n,q] (y)
```

8 Enter a password for the management server service account and confirm it at the next prompt.

```
Enter a password for the CMC service account:xxxxxx
Confirm the password you entered for the CMC service
account:xxxxxx
```

When you install and configure cluster connector, you must provide this same password for the CMC_CC@CMC_SERVICES account.

After you confirm the password for the service account, the setup program displays:

- A list of pre-upgrade tasks as it performs them
- Uninstallation progress percentages for prior components
- Installation progress percentages for the upgrade components

If the installation is successful, the setup program displays the following message:

```
Installation completed successfully on all systems. Upgrading
management server configuration.
```

9 Enter **y** to start Veritas Cluster Management Console processes now.

```
Do you want to start Veritas Cluster Management Console
processes now?
[y,n,q,?] (y)
```

The setup program displays progress percentages for starting the console. After the console starts, the setup program displays the location of the upgrade log files and then logs in with the initial user account. The account information for this user is echoed to the screen so that you can see the initial user information.

The setup program reports the state of any managed clusters as EXITED. This is because the CommandCentral Availability cluster monitor cannot communicate with the Cluster Management Console management server. After you upgrade each cluster monitor to cluster connector, all clusters except for direct connection clusters show up in the Cluster Management Console. You must add direct connection clusters manually using the Administration tab in the Cluster Management Console.

The setup program eventually displays the following message:

```
End of upgrade
```

Copying the VCS installation guide and release notes to each node

After you install the management server, copy the Install Guide and the Release Notes over to the management server. The documentation locations on the distribution disc are:

- Install Guide
  cluster_server/docs/vcs_install.pdf
- Release Notes
  cluster_server/release_notes/vcs_notes.pdf

Accessing Cluster Management Console information

Information about administering clusters in multi-cluster mode is available in the Veritas Cluster Server Centralized Management Guide. The online help includes information about administering clusters in both single-cluster and multi-cluster mode. If you want to access the information about managing a single cluster in printed documentation, you can install the documentation package to the desired system.

The documentation package name for each supported operating system is:

- AIX—VRTSvcs.doc
- HP-UX—VRTSvcsdc
  Note that you can copy the documents from depot/VRTSvcsdc/ VRTSvcsdc/ opt/ VRTS/docs.
- Linux—VRTSvcsdc
- Solaris—VRTSvcsdc

Upgrading the management server on Windows systems

You must perform this upgrade on a standalone server system that is outside all clusters and available on the local network. The system must currently host the CommandCentral Availability management server (predecesor to the Cluster Management Console management server). Symantec Product Authentication

Service, a shared component, is installed during management server upgrade. If an older version of the service is installed, it is upgraded to the latest version.

To upgrade the management server on Windows

1. Insert the disc into the drive on the local system.
2. On the distribution disc, locate the **\installer** directory.
3. Double-click the **setup** file.
   Depending upon the operating system, you may or may not receive the following warning message:
   The publisher could not be verified. Are you sure you want to run this software?
   If you receive this message, click **Run**.
4. In the Welcome to the Veritas Cluster Mangement Console Installation Manager dialog box, read the introduction and then click **Next**.
5. In the Installation and Configuration Options dialog box, click **Upgrade the management server on the local node** and then click **Next**.
6. In the warning message box, read the information about:
   - Backing up your database using the Settings tab in your current (non-upgraded) console. This task can help to protect your cluster configurations, historical cluster data, and console settings if the upgrade fails or produces unexpected results.
   - Upgrading existing cluster connectors (CommandCentral Availabiliy cluster monitors) to enable cluster management in the upgraded console. The Cluster Management Console cannot manage clusters that currently run cluster monitor until you perform this upgrade.

   Click **OK**.
7. When prompted, enter the password for the management server service account for cluster connector, CC_CMC@CMC_SERVICES.
   Record the password that you enter in a safe place. You must use it again whenever you install or configure cluster connector.
8. In the Summary dialog box, read the summarized record of the upgrade and then click **Next**.
9. In the Upgrading to Cluster Management Console dialog box, when you see the following message, click **Next**:
   `Restoration of databaes on node NodeName complete.`
   where *NodeName* if the name of the system on which are performing the upgrade.
10. Click **Finish**.

Upgrading cluster monitor to cluster connector on UNIX systems

You must perform this upgrade on each cluster that formerly used CommandCentral Availability cluster monitor to communicate with the CommandCentral Availability management server. This procedure follows a script of a successful upgrade. If at any step you experience a result other than the expected result that is documented here, you can click “n” to re-enter information. If you continue to have problems, click “q” to quit the installation and then verify the installation prerequisites.

To upgrade cluster monitor to cluster connector

1. Insert the disc into the drive on the local system. At the command prompt, type the following command to run the setup program:

   ```
   ./installer -rsh
   ```

   The setup program presents copyright information followed by a menu titled, “Storage Foundation and High Availability Solutions 5.0”.

2. Enter **i** to specify a task.

   ```
   Enter a Task: [I,C,L,P,U,D,Q,?] i
   ```

   The setup program displays another menu that lists products that are available for installation.

3. Select the menu number that corresponds to Veritas Cluster Management Console.

   ```
   Select a product to install: [1-13,b,q]
   ```

   The setup program presents a description of the product.

4. Enter **2** to select a product component.

   ```
   Enter '1' to install the management server, '2' to install the
   cluster
   connector: [1-2,q] (1) 2
   ```

   The setup program presents a message stating that it will install cluster connector.

5. Enter **y** to verify that the information up to this point is correct.

   ```
   Is this information correct? [y,n,q] (y)
   ```

   The setup program performs an initial system check of the local system and checks for installed packages on the local system. If these checks are satisfactory, the setup program lists the packages to be installed.

   ```
   Storage Foundation and High Availability Solutions 5.0
   installer will upgrade or install the following Cluster
   Management Console
   packages:
   VRTSat       Symantec Product Authentication Service
   VRTSperl     Veritas Perl 5.8.8 Redistribution
   VRTSjre15    Veritas Java Runtime Environment Redistribution
   ```

```
VRTScmccc    Veritas Cluster Management Console Cluster
Connector
Press [Return] to continue:
```

6 Press Enter.

The setup program displays the following message:

```
Installer is now ready to upgrade Cluster Management Console.
All Cluster Management Console processes that are currently
running must be stopped.
```

7 Enter **y** to confirm that you want to upgrade the Cluster Management Console.

```
Are you sure you want to upgrade Cluster Management Console?
[y,n,q] (y)
```

8 Enter a password for the cluster connector service account.

The password is the password that was entered for the cluster connector service account during management server installation.

```
Enter the password for the CMC service account:xxxxx
```

9 Enter the root hash of the authentication broker installed on the management server.

```
Enter the hash of the Management Server's root broker [?]
```

To retrieve the root hash of the management server authentication broker, run the following command:

- On Windows:

  \program files\veritas\security\authentication\bin\vssat showbrokerhash

- On UNIX systems:

  /opt/VRTSat/bin/vssat showbrokerhash

The output of this command looks similar to the following:

```
Root Hash:      9dfde3d9aaebee084f8e35819c1fed7e6b01d2ae
```

Enter the alphanumeric string (the string you receive is different from the one shown).

10 Enter **y** to verify that the information up to this point is correct.

The setup program presents a list of:

- Prior component shutdown progress percentages
- Prior component uninstallation progress percentages
- Upgrade component installation progress percentages
- Cluster connector deployment messages
- Cluster connector configuraiton messages

11 Enter **y** to start Veritas Cluster Management Console processes now.

```
Do you want to start Veritas Cluster Management Console
processes now? [y,n,q] (y)
```

The setup program presents startup progress percentages and, if successful, displays the following message:

```
Installation completed successfully on all systems
```

After the console starts, the setup program displays the location of the upgrade log files and then displays:

- Information about each upgrade package that was installed.
- Status information for each system, service group, and resource in the cluster.
- A message that is an evaluation of the state of the upgrade (success or failure).

The setup program eventually displays the following message:

```
End of upgrade
```

Upgrading cluster monitor to cluster connector on Windows platforms

You must perform this upgrade on each cluster that formerly used CommandCentral Availability cluster monitor to communicate with the CommandCentral Availability management server.

To upgrade cluster monitor to cluster connector

1. In CommandCentral Availability, locate and record the value of the GUID attribute. This attribute is on the CCAvail_ClusterConfig resource.
2. Uninstall cluster monitor on each cluster node.
   Refer to the CommandCentral Availability documentation for cluster monitor uninstallation instructions.
3. Insert the distribution disc into the DVD drive on the cluster node.
4. Obtain a command prompt and navigate to the **\installer** directory.
5. At the command line, enter the following command:
   `setup.bat -guid xxxxxx`
   where ***xxxxxx*** is the value of the GUID attribute you recorded in step 1. The setup program installs the Cluster Management Console cluster connector.

For information on the documentation that comes with this release, see:

- “Copying the VCS installation guide and release notes to each node” on page 177
- “Accessing Cluster Management Console information” on page 177

Chapter 8

Adding and removing cluster nodes

This chapter contains the following topics:

About adding and removing nodes

After installing VCS and creating a cluster, you can add and remove nodes from the cluster. You can create a clusters of up to 32 nodes.

Adding a node to a cluster

The system you add to the cluster must meet the hardware and software requirements.

See "Preparing to install and configure VCS" on page 21.

Table 8-1 specifies the tasks involved in adding a cluster. The example demonstrates how to add a node east to already existing nodes, north and south.

Table 8-1 Tasks involved in adding a node to a cluster

Task	Reference
Set up the hardware.	"Setting up the hardware" on page 184
Install the software manually and add a license key.	"Installing the VCS software manually" on page 185

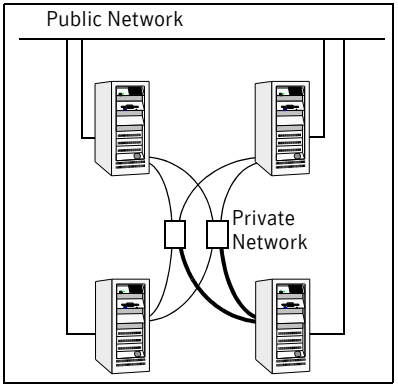
Table 8-1 Tasks involved in adding a node to a cluster

Task	Reference
Configure LLT and GAB.	"Configuring LLT and GAB" on page 185
Add the node to the existing cluster.	"Adding the node to the existing cluster" on page 186
Start VCS and verify the cluster.	"Starting VCS and verifying the cluster" on page 187

Setting up the hardware

Before configuring a new system to an existing cluster, you must physically add the system to the cluster.

Figure 8-1 Adding a node to a three-node cluster using two independent hubs



To set up the hardware

1 Connect the VCS private Ethernet controllers.

- If you are expanding from a two-node cluster, you need to use independent hubs for the private network connections, replacing crossover cables if they are used.
- If you already use independent hubs, connect the two Ethernet controllers on the new node to the independent hubs.

Figure 8-1 illustrates a new node being added to an existing three-node cluster using two independent hubs.

2 Connect the system to the shared storage, if required.

Installing the VCS software manually

Install the VCS 5.0 filesets manually and install the license key.

See "Installing VCS software manually" on page 108.

See "Adding a license key" on page 111.

Configuring LLT and GAB

Create the LLT and GAB configuration files on the new node and update the files on the existing nodes.

To configure LLT

1. Create the file /etc/llthosts on the new node. You must also update it on each of the current nodes in the cluster.

   For example, suppose you are adding east to a cluster consisting of north and south:

   - If the file on one of the existing nodes resembles:

     ```
     0 north
     1 south
     ```

   - Update the file for all nodes, including the new one, resembling:

     ```
     0 north
     1 south
     2 east
     ```

2. Create the file /etc/lltab on the new node, making sure that line beginning "`set-node`" specifies the new node.

   The file /etc/lltab on an existing node can serve as a guide.

   See "/etc/lltab" on page 152.

   The following example describes a system where node east is the new node on cluster number 2:

   ```
   set-node east
   set-cluster 2
   link en2 /dev/dlpi/en:2 - ether - -
   link en3 /dev/dlpi/en:3 - ether - -
   ```

3. On the new system, run the command:

   ```
   # /sbin/lltconfig -c
   ```

To configure GAB

1. Create the file /etc/gabtab on the new system.

   - If the /etc/gabtab file on the existing nodes resembles:

     ```
     /sbin/gabconfig -c
     ```

then the file on the new node should be the same, although it is recommended to use the `-c -nN` option, where *N* is the number of cluster nodes.

- If the /etc/gabtab file on the existing nodes resembles:
  `/sbin/gabconfig -c -n2`
  then, the file on all nodes, including the new node, should change to reflect the change in the number of cluster nodes. For example, the new file on each node should resemble:
  `/sbin/gabconfig -c -n3`
  See "/etc/gabtab" on page 152.
  The `-n` flag indicates to VCS the number of nodes required to be ready to form a cluster before VCS starts.

2 On the new node, run the command, to configure GAB:
```
# /sbin/gabconfig -c
```

To verify GAB

1 On the new node, run the command:
```
# /sbin/gabconfig -a
```
The output should indicate that *Port a* membership shows all nodes including the new node. The output should resemble:
```
GAB Port Memberships
===================================
Port a gen a3640003 membership 012
```
See "Verifying GAB" on page 159.

2 Run the same command on the other nodes (north and south) to verify that the *Port a* membership includes the new node:
```
# /sbin/gabconfig -a
GAB Port Memberships
===================================
Port a gen a3640003 membership 012
Port h gen fd570002 membership 01
Port h gen fd570002    visible ; 2
```

Adding the node to the existing cluster

Perform the tasks on one of the existing nodes in the cluster.

To add the new node to the existing cluster

1 Enter the command:
```
# haconf -makerw
```

2 Add the new system to the cluster:
```
# hasys -add east
```

3 Stop VCS on the new node:

```
# hastop -sys east
```

4 Copy the main .cf file from an existing node to your new node:

```
# rcp /etc/VRTSvcs/conf/config/main.cf east:/etc/VRTSvcs/conf/config/
```

5 Start VCS on the new node:

```
# hastart
```

6 If necessary, modify any new system attributes.

7 Enter the command:

```
# haconf -dump -makero
```

Starting VCS and verifying the cluster

Start VCS after adding the new node to the cluster and verify the cluster.

To start VCS and verify the cluster

1 From the new system, start VCS with the new system added to the cluster:

```
# hastart
```

2 Run the GAB configuration command on each node to verify that *Port a* and *Port h* include the new node in the membership:

```
# /sbin/gabconfig -a
    GAB Port Memberships
    ===================================
    Port a gen a3640003 membership 012
    Port h gen fd570002 membership 012
```

Removing a node from a cluster

Table 8-2 specifies the tasks involved in removing a node from a cluster. In the example procedure, the cluster consists of nodes A, B, and C; node C is to leave the cluster.

Table 8-2 Tasks involved in removing a node

Task	Reference
■ Back up the configuration file. ■ Check the status of the nodes and the service groups.	"Verify the status of nodes and service groups" on page 188

Table 8-2 Tasks involved in removing a node

Task	Reference
■ Switch or remove any VCS service groups on the node leaving the cluster. ■ Delete the node from VCS configuration.	"Deleting the leaving node from VCS configuration" on page 189
Modify the llthosts and gabtab files to reflect the change.	"Modifying configuration files on each remaining node" on page 190
On the node leaving the cluster: ■ Modify startup scripts for LLT, GAB, and VCS to allow reboot of the node without affecting the cluster. ■ Unconfigure and unload the LLT and GAB utilities. ■ Remove the VCS filesets.	"Unloading LLT and GAB and removing VCS on the leaving node" on page 191

Verify the status of nodes and service groups

Start by issuing the following commands from one of the nodes to remain, node A or node B.

To verify the status of the nodes and the service groups

1 Make a backup copy of the current configuration file, main.cf.

```
# cp -p /etc/VRTSvcs/conf/config/main.cf \
/etc/VRTSvcs/conf/config/main.cf.goodcopy
```

2 Check the status of the systems and the service groups.

```
# hastatus -summary
```

```
-- SYSTEM STATE
-- System      State          Frozen
A  A           RUNNING        0
A  B           RUNNING        0
A  C           RUNNING        0

-- GROUP STATE
-- Group    System      Probed   AutoDisabled   State
B  grp1     A           Y        N              ONLINE
B  grp1     B           Y        N              OFFLINE
B  grp2     A           Y        N              ONLINE
B  grp3     B           Y        N              OFFLINE
B  grp3     C           Y        N              ONLINE
B  grp4     C           Y        N              ONLINE
```

The example output from the `hastatus` command shows that nodes A, B, and C are the nodes in the cluster. Also, service group grp3 is configured to

run on node B and node C, the leaving node. Service group grp4 runs only on node C. Service groups grp1 and grp2 do not run on node C.

Deleting the leaving node from VCS configuration

Before removing a node from the cluster, you must remove or switch from the leaving node the service groups on which other service groups depend.

To remove or switch service groups from the leaving node

1. Switch failover service groups from the leaving node. You can switch grp3 from node C to node B.

   ```
   # hagrp -switch grp3 -to B
   ```

2. Check for any dependencies involving any service groups that run on the leaving node; for example, grp4 runs only on the leaving node.

   ```
   # hagrp -dep
   ```

3. If the service group on the leaving node requires other service groups, that is, if it is a parent to service groups on other nodes, then unlink the service groups.

   ```
   # haconf -makerw
   # hagrp -unlink grp4 grp1
   ```

   These commands enable you to edit the configuration and to remove the requirement grp4 has for grp1.

4. Stop VCS on the leaving node:

   ```
   # hastop -sys C
   ```

5. Check the status again. The state of the leaving node should be EXITED. Also, any service groups set up for failover should be online on other nodes:

   ```
   # hastatus -summary
   ```

   ```
   -- SYSTEM STATE
   -- System      State          Frozen
   A  A           RUNNING        0
   A  B           RUNNING        0
   A  C           EXITED         0

   -- GROUP STATE
   -- Group    System      Probed   AutoDisabled   State
   B  grp1     A           Y        N              ONLINE
   B  grp1     B           Y        N              OFFLINE
   B  grp2     A           Y        N              ONLINE
   B  grp3     B           Y        N              ONLINE
   B  grp3     C           Y        Y              OFFLINE
   B  grp4     C           Y        N              OFFLINE
   ```

6 Delete the leaving node from the SystemList of service groups grp3 and grp4.

```
# hagrp -modify grp3 SystemList -delete C
# hagrp -modify grp4 SystemList -delete C
```

7 For service groups that run only on the leaving node, delete the resources from the group before deleting the group.

```
# hagrp -resources grp4
   processx_grp4
   processy_grp4
# hares -delete processx_grp4
# hares -delete processy_grp4
```

8 Delete the service group configured to run on the leaving node.

```
# hagrp -delete grp4
```

9 Check the status.

```
# hastatus -summary
   -- SYSTEM STATE
   -- System      State          Frozen
   A  A           RUNNING        0
   A  B           RUNNING        0
   A  C           EXITED         0

   -- GROUP STATE
   -- Group    System      Probed   AutoDisabled   State
   B  grp1     A           Y        N              ONLINE
   B  grp1     B           Y        N              OFFLINE
   B  grp2     A           Y        N              ONLINE
   B  grp3     B           Y        N              ONLINE
```

10 Delete the node from the cluster.

```
# hasys -delete C
```

11 Save the configuration, making it read only.

```
# haconf -dump -makero
```

Modifying configuration files on each remaining node

Perform the following tasks on each of the remaining nodes of the cluster.

To modify the configuration files on a remaining node

1 If necessary, modify the /etc/gabtab file.

No change is required to this file if the `/sbin/gabconfig` command has only the argument `-c`, although Symantec recommends using the `-n`*N* option, where *N* is the number of cluster systems.

If the command has the form `/sbin/gabconfig -c -n`*N*, where *N* is the number of cluster systems, then make sure that *N* is not greater than the actual number of nodes in the cluster, or GAB does not automatically seed.

Note: Symantec does not recommend the use of the `-c -x` option for `/sbin/gabconfig`. The Gigabit Ethernet controller does not support the use of `-c -x`.

2 Modify /etc/llthosts file on each remaining nodes to remove the entry of the leaving node.

For example, change:

```
0 A
1 B
2 C
```

to:

```
0 A
1 B
```

Unloading LLT and GAB and removing VCS on the leaving node

On the node leaving the cluster, unconfigure and unload the LLT and GAB utilities, and remove the VCS filesets.

See "Removing VCS filesets manually" on page 116.

Chapter 9

Installing VCS on a single node

This chapter contains the following topics:

About installing VCS on a single node

You can install VCS 5.0 on a single node. You can subsequently add another node to the single-node cluster to form a multinode cluster. You can also prepare a single node cluster for addition into a multi-node cluster. Single node clusters can be used for testing as well.

You can install VCS onto a single node using the installer program or you can add it manually.

See "Creating a single-node cluster using the installer program" on page 194.

See "Creating a single-node cluster manually" on page 195.

Creating a single-node cluster using the installer program

Table 9-4 specifies the tasks involved in installing VCS on a single node using the installer program.

Table 9-3 Tasks to create a single-node cluster using the installer

Task	Reference
Prepare for installation.	"Preparing for a single node installation" on page 194
Install the VCS software on the system using the installer.	"Starting the installer for the single node cluster" on page 194

Preparing for a single node installation

You can use the installer program to install a cluster on a single system for two purposes:

- To prepare the single node cluster to join a larger cluster
- To prepare the single node cluster to be a standalone single node cluster

When you prepare it to join a larger cluster, install it with LLT and GAB. For a standalone cluster, you do not need to enable LLT and GAB.

For more information about LLT and GAB:

See "LLT and GAB" on page 17.

Starting the installer for the single node cluster

When you install VCS on a single system, follow the instructions in this guide for installing VCS using the product installer.

See "Starting the software installation" on page 62.

During the installation, you need to answer two questions specifically for single node installations. When the installer asks:

```
Enter the system names separated by spaces on which to install
VCS:
```

Enter a single system name. The installer now asks if you want to enable LLT and GAB:

```
If you plan to run VCS on a single node without any need for
adding cluster node online, you have an option to proceed
without starting GAB and LLT.
```

```
Starting GAB and LLT is recommended.
Do you want to start GAB and LLT? [y,n,q,?] (n)
```

Answer **n** if you want to use the single node cluster as a standalone cluster.

Answer **y** if you plan to incorporate the single node cluster into a multi-node cluster in the future.

Continue with the installation.

See "Licensing VCS" on page 63.

Creating a single-node cluster manually

Table 9-4 specifies the tasks involved in installing VCS on a single node.

Table 9-4 Tasks to create a single-node cluster manually

Task	Reference
Set the PATH variable	"Setting the PATH variable" on page 195
Install the VCS software manually and add a license key	"Installing VCS software manually" on page 108
Remove any LLT or GAB configuration files and rename LLT and GAB startup files. A single-node cluster does not require the node-to-node communication service, LLT, or the membership communication service, GAB.	"Renaming the LLT and GAB startup files" on page 196
Create and modify the VCS configuration files.	"Configuring VCS" on page 196
Start VCS and verify single-node operation.	"Verifying single-node operation" on page 197

Setting the PATH variable

Installation commands as well as other commands reside in the `/sbin`, `/usr/sbin`, `/opt/VRTS/bin`, and `/opt/VRTSvcs/bin` directories. Add these directories to your PATH environment variable.

To set the PATH variable

- Do one of the following:
  - For the Bourne Shell (sh or ksh), type:

    ```
    $ PATH=/usr/sbin:/sbin:/opt/VRTS/bin:/opt/VRTSvcs/bin:\
    $PATH; export PATH
    ```
  - For the C Shell (csh or tcsh), type:

    ```
    % setenv PATH /usr/sbin:/sbin:/opt/VRTS/bin:\
    /opt/VRTSvcs/bin:$PATH
    ```

Installing the VCS software manually

Install the VCS 5.0 filesets manually and install the license key.

See "Installing VCS software manually" on page 108.

See "Adding a license key" on page 111.

Renaming the LLT and GAB startup files

You may need the LLT and GAB startup files if you need to upgrade the single-node cluster to a multiple-node cluster at a later time.

To rename the LLT and GAB startup files

- Rename the LLT and GAB startup files.

  ```
  # mv /etc/rc2.d/S70llt /etc/rc2.d/X70llt
  # mv /etc/rc2.d/S92gab /etc/rc2.d/X92gab
  ```

Configuring VCS

VCS configuration requires the types.cf and main.cf files on each system in the cluster. Both of the files are in the /etc/VRTSvcs/conf/config directory.

main.cf file

The main.cf configuration file requires the following minimum essential elements:

- An "include" statement that specifies the file, types.cf, which defines the VCS bundled agent resources.
- The name of the cluster.
- The name of the systems that make up the cluster.

Editing the main.cf file

When you manually install VCS, the file /etc/VRTSvcs/conf/config/main.cf contains only the line:

```
include "types.cf"
```

To edit the main.cf file

1. Log in as superuser, and move to the directory containing the configuration file:

   ```
   # cd /etc/VRTSvcs/conf/config
   ```

2. Using vi, or another text editor, edit the main.cf file, defining your cluster name and system names. Refer to the following example.

3. Save and close the file.

Refer to the *Veritas Cluster Server User's Guide* for a full description of the main.cf file, how to edit it and verify it.

Example, main.cf

An example main.cf for a two-node cluster:

```
include "types.cf"
cluster VCSCluster2 ( )
system north
system south
```

An example main.cf for a single-node cluster:

```
include "types.cf"
cluster VCSCluster1 ( )
system sn1
```

types.cf file

Note that the "include" statement in main.cf refers to a file named types.cf. This text file describes the VCS bundled agent resources. During new installations, the types.cf file is automatically copied in to the /etc/VRTSvcs/conf/config directory.

Verifying single-node operation

After succesffully creating a single-node cluster, start VCS and verify the cluster.

To verify single-node cluster

1. Bring up VCS manually as a single-node cluster using `hastart`(1M) with the `-onenode` option:

   ```
   # hastart -onenode
   ```

2 Verify that the `had` and `hashadow` daemons are running in single-node mode:

```
# ps -ef | grep ha
root  285   1  0 14:49:31 ?  0:02 /opt/VRTSvcs/bin/had -onenode
root  288   1  0 14:49:33 ?  0:00 /opt/VRTSvcs/bin/hashadow
```

Adding a node to a single-node cluster

Table 9-5 specifies the activities involved in adding nodes to a single-node cluster. All nodes in the new cluster must run the same version of VCS. The example procedure refers to the existing single-node VCS node as Node A and the node that is to join Node A to form a multiple-node cluster as Node B.

Table 9-5 Tasks to add a node to a single-node cluster

Task	Reference
Set up Node B to be compatible with Node A	"Setting up a node to join the single-node cluster" on page 199
■ Add ethernet cards for private heartbeat network for Node B ■ If necessary, add ethernet cards for private heartbeat network for Node A ■ Make the ethernet cable connections between the two nodes	"Installing and configuring Ethernet cards for private network" on page 200
Connect both nodes to shared storage	"Configuring the shared storage" on page 200
■ Bring up VCS on Node A ■ Edit the configuration file	"Bringing up the existing node" on page 200
If necessary, install VCS on Node B and add a license key. Make sure Node B is running the same version of VCS as the version on Node A.	"Installing the VCS software manually" on page 201
Edit the configuration files on Node B	"Creating configuration files" on page 201
Start LLT and GAB on Node B	"Starting LLT and GAB" on page 201
■ Start LLT and GAB on Node A ■ Restart VCS on Node A ■ Modify service groups for two nodes	"Reconfiguring VCS on the existing node" on page 201

Table 9-5 Tasks to add a node to a single-node cluster

Task	Reference
■ Start VCS on Node B ■ Verify the two-node cluster	"Verifying configuration on both nodes" on page 202

Setting up a node to join the single-node cluster

The new node to join the existing single node running VCS must run the same version of operating system and patch level.

To set up a node to join the single-node cluster

1 Do one of the following:

- If VCS is not currently running on Node B, proceed to step 2.
- If the node you plan to add as Node B is currently part of an existing cluster, remove the node from the cluster. After removing the node from the cluster, remove the VCS filesets and configuration files.
  See "Removing a node from a cluster" on page 187.
- If the node you plan to add as Node B is also currently a single VCS node, uninstall VCS.
  See "Removing VCS filesets manually" on page 116.
- If you renamed the LLT and GAB startup files, remove them.
  See "Renaming the LLT and GAB startup files" on page 196.

2 If necessary, install VxVM and VxFS.
See "Installing VxVM, VxFS if necessary" on page 199.

Installing VxVM, VxFS if necessary

If VxVM with the cluster option or VxFS with the cluster option is installed on the existing node in the cluster, then the same versions must also be installed on the new node.

Refer to the appropriate documentation for VxVM and VxFS to verify the versions of the installed products and make sure the same version is running on all nodes that are to use any shared storage.

Installing and configuring Ethernet cards for private network

Both nodes require ethernet cards (NICs) that enable the private network. If both Node A and Node B have ethernet cards installed, you can ignore this step.

For high availability, two separate NICs on each node should be used, such that the failure of one NIC does not restrict heartbeating between the nodes.

See "Setting up the private network" on page 45.

To install and configure ethernet cards for private network

1. Shut down VCS on Node A.
   ```
   # hastop -local
   ```
2. Shut down the nodes.
   ```
   # shutdown -F
   ```
3. Install the ethernet card on Node A.
4. Install the ethernet card on Node B.
5. Configure the ethernet card on both nodes.
6. Make the two ethernet cable connections from Node A to Node B for the private networks.
7. Restart the nodes.

Configuring the shared storage

Make the connection to shared storage from Node B. Configure VxVM on Node B and reboot the node when you are prompted.

See "Setting up shared storage" on page 46.

Bringing up the existing node

8. Log in as superuser.
9. Make the VCS configuration writable.
   ```
   # haconf -makerw
   ```
10. Display the service groups currently configured.
    ```
    # hagrp -list
    ```
11. Freeze the service groups.
    ```
    # hagrp -freeze group -persistent
    ```
    Repeat this command for each service group listed in step 10.
12. Make the configuration read-only.
    ```
    # haconf -dump -makero
    ```

13 Stop VCS on Node A.

```
# hastop -local -force
```

14 Rename the GAB and LLT startup files so they can be used.

```
# mv /etc/rc2.d/X92gab /etc/rc2.d/S92gab
# mv /etc/rc2.d/X70llt /etc/rc2.d/S70llt
```

Installing the VCS software manually

Install the VCS 5.0 filesets manually and install the license key.

See "Installing VCS software manually" on page 108.

See "Adding a license key" on page 111.

Creating configuration files

1 Create the file /etc/llttab that lists both the nodes.
See "Setting Up /etc/llttab" on page 112.

2 Create the file /etc/llthosts. Set up /etc/llthosts for a two-node cluster.
See to "Setting up /etc/llthosts" on page 112.

3 Create the file /etc/gabtab.
See "Configuring group membership and atomic broadcast (GAB)" on page 114.

Starting LLT and GAB

On the new node, start LLT and GAB.

To start LLT and GAB

1 Start LLT on Node B.

```
# /etc/rc.d/rc2.d/S70llt start
```

2 Start GAB on Node B.

```
# /etc/rc.d/rc2.d/S92gab start
```

Reconfiguring VCS on the existing node

1 On Node A, create the files /etc/llttab, /etc/llthosts, and /etc/gabtab. Use the files created on Node B as a guide, customizing the /etc/llttab for Node A.

2 Start LLT on Node A.

```
# /etc/rc.d/rc2.d/S70llt start
```

3 Start GAB on Node A.

```
# /etc/rc.d/rc2.d/S92gab start
```

4 Check the membership of the cluster.
```
# gabconfig -a
```
5 Start VCS on Node A.
```
# hastart
```
6 Make the VCS configuration writable.
```
# haconf -makerw
```
7 Add Node B to the cluster.
```
# hasys -add sysB
```
8 Add Node B to the system list of each service group.
- List the service groups.
```
# hagrp -list
```
- For each service group listed, add the node.
```
# hagrp -modify group SystemList -add sysB 1
```

Verifying configuration on both nodes

1 On Node B, check the cluster membership.
```
# gabconfig -a
```
2 Start the VCS on Node B.
```
# hastart
```
3 Verify that VCS is up on both nodes.
```
# hastatus
```
4 List the service groups.
```
# hagrp -list
```
5 Unfreeze the service groups.
```
# hagrp -unfreeze group -persistent
```
6 Implement the new two-node configuration.
```
# haconf -dump -makero
```

Appendix A

Advanced topics related to installing VCS

This appendix contains the following topics:

Changing NFS server major numbers for VxVM volumes

Use the `haremajor` command to determine and reassign, if necessary, the major number used by a system for shared VxVM volume block devices. For Veritas Volume Manager, the major number is set to the `vxio` driver number. To be highly available, each NFS server in a VCS cluster must have the same `vxio` driver number, or major number.

To list the major number currently in use on a system

Use the command:

```
# haremajor -v
55
```

Run this command on each cluster node. If major numbers are not the same on each node, you must change them on the nodes so that they are identical.

To list currently available major numbers for a system

Use the command:

```
# haremajor -a
54,56..58,60,62..
```

The output shows the numbers that are not being used on the system where the command is issued.

To reset the major number on a system

You can reset the major number to an available number on a system. For example, to set the major number to 75 type:

```
# haremajor -s 75
```

LLT over UDP

VCS 5.0 provides the option of using LLT over the UDP (User Datagram Protocol) layer for clusters using wide-area networks and routers. UDP makes LLT packets routable and thus able to span longer distances more economically.

Note: LLT over UDP is not supported on IPV6.

When to use LLT over UDP

Use LLT over UDP when:

- LLT must be used over WANs
- When hardware, such as blade servers, do not support LLT over Ethernet

Performance considerations

Because LLT over UDP is slower that LLT over Ethernet, LLT over UDP should only be used when the hardware configuration makes it necessary.

Configuring LLT over UDP

Following is a checklist for configuring LLT over UDP. Examples are provided in the sections that follow.

- Make sure that the LLT private links are on different physical networks.
  If the LLT private links are not on different physical networks, then make sure that the links are on separate subnets. Set the broadcast address in /etc/llttab explicitly depending on the subnet for each link.
  See “Broadcast address in the /etc/llttab file” on page 205.
  See the examples in the following sections.
- Make sure that each NIC has an IP address configured before configuring LLT.

- Make sure the IP addresses in the /etc/llttab files are consistent with the IP addresses of the network interfaces.
- Make sure that each link has a unique non-well known UDP port.
  See "Selecting UDP ports" on page 206.
- Set the broadcast address correctly for direct-attached (non-routed) links.
- For links that cross an IP router, disable broadcast features and specify the IP address of each link manually in the /etc/llttab file.
  See "Sample configuration: Links crossing IP routers" on page 209.

Broadcast address in the /etc/llttab file

The broadcast address is set explicitly for each link in the following example.

```
# cat /etc/llttab
set-node Node0
set-cluster 1
link link1 /dev/xti/udp - udp 50000  -  10.20.30.1  10.20.30.255
link link2 /dev/xti/udp - udp 50001  -  10.20.31.1  10.20.31.255
```

Verify the subnet mask using the `ifconfig` command to ensure that the two links are on separate subnets.

The link command in the /etc/llttab file

Table A-6 describes the fields of the `link` command shown in the /etc/llttab file examples.

See "Sample configuration: Direct-attached links" on page 208.

See "Sample configuration: Links crossing IP routers" on page 209.

Note that some of these fields differ from the command for standard LLT links.

Table A-6 Field description for link command in /etc/llttab

Field	Description
`<tag-name>`	A unique string that is used as a tag by LLT; for example link1, link2,....
`<device>`	The device path of the UDP protocol; for example /dev/xti/udp.
`<node-range>`	Nodes using the link. "-" indicates *all* cluster nodes are to be configured for this link.
`<link-type>`	Type of link; must be "`udp`" for LLT over UDP.
`<udp-port>`	Unique UDP port in the range of 49152-65535 for the link. See "Selecting UDP ports" on page 206.

Table A-6 Field description for link command in /etc/lltab

Field	Description
`<MTU>`	"-" is the default, which has a value of 8192. The value may be increased or decreased depending on the configuration. Use the `lltstat -l` command displays the current value.
`<IP address>`	IP address of the link on the local node.
`<bcast-address>`	■ For clusters having broadcasts enabled, specify the value of the subnet broadcast address. ■ "-" is the default for clusters spanning routers.

The set-addr command in the /etc/lltab file

The `set-addr` command in the /etc/lltab file is required when the broadcast feature of LLT is disabled, such as when LLT must cross IP routers. Table A-7 describes the fields of the `set-addr` command.

See "Sample configuration: Links crossing IP routers" on page 209.

Table A-7 Field description for set-addr command in /etc/lltab

Field	Description
`<node-id>`	The ID of the cluster node; for example, 0.
`<link tag-name>`	The string used by LLT to identify the link; for example link1, link2,....
`<address>`	IP address assigned to the link for the peer node.

Selecting UDP ports

When selecting a UDP port, select an available 16-bit integer from the range described below.

- Use available ports (that is, ports that are not in use)] in the private range 49152 to 65535
- Do not use:
  - Ports from the range of well-known ports, 0 to 1023
  - Ports from the range of registered ports, 1024 to 49151

To check which ports are defined as defaults for a node, examine the file /etc/services. You should also use the `netstat` command to list the UDP ports currently in use. For example:

```
# netstat -a | more
UDP
   Local Address         Remote Address     State
-------------------- -------------------- -------
      *.*                                  Unbound
      *.32771                              Idle
      *.32776                              Idle
      *.32777                              Idle
      *.name                               Idle
      *.biff                               Idle
      *.talk                               Idle
      *.32779                              Idle
.
.
.
      *.55098                              Idle
      *.syslog                             Idle
      *.58702                              Idle
      *.*                                  Unbound
```

Look in the UDP section of the output; UDP ports listed under Local Address are already in use. If a port is listed in the /etc/services file, its associated name is displayed rather than the port number in the output.

Configuring LLT on subnets

You need to make sure to properly configure the netmask and broadcast address when nodes reside on different subnets.

Configuring the netmask

If you have nodes on different subnets, set the netmask so that the nodes can access the subnets in use.

For example:

- For first network interface

  ```
  IP address=192.168.30.1, Broadcast address=192.168.30.255,
  Netmask=255.255.255.0
  ```

- For second network interface

  ```
  IP address=192.168.31.1, Broadcast address=192.168.31.255,
  Netmask=Mask:255.255.255.0
  ```

Configuring the broadcast address

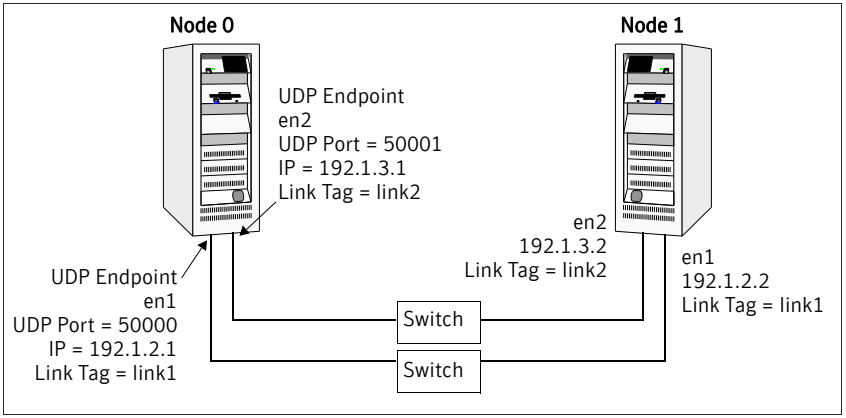
If you have nodes on different subnets, set the broadcast address in /etc/llttab depending on the subnet that the links are on.

An example of a typical /etc/llttab file when nodes are on different subnets. Note the *explicitly* set broadcast address for each link.

```
# cat /etc/llttab
set-node nodexyz
set-cluster 100
link link1 /dev/xti/udp - udp 50000 - 192.168.30.1
192.168.30.255
link link2 /dev/xti/udp - udp 50001 - 192.168.31.1
192.168.31.255
```

Sample configuration: Direct-attached links

The following illustration depicts a typical configuration of direct-attached links employing LLT over UDP.



The configuration represented by the following /etc/llttab file for Node 0 has directly attached crossover links or links connected through a hub or switch. These links do not cross routers.

Because LLT broadcasts requests peer nodes to discover their addresses, the addresses of peer nodes do not need to be specified in the /etc/llttab file using the `set-addr` command. For direct attached links, you do need to set the broadcast address of the links in the /etc/llttab file. Verify that the IP addresses and broadcast addresses are set correctly by using the `ifconfig -a` command.

```
set-node Node0
set-cluster 1
#configure Links
#link <tag-name> <device> <node-range> <link-type> <udp port>
<MTU> <IP-address> <bcast-address>
link link1 /dev/xti/udp - udp 50000 - 192.1.2.1 192.1.2.255
link link2 /dev/xti/udp - udp 50001 - 192.1.3.1 192.1.3.255
```

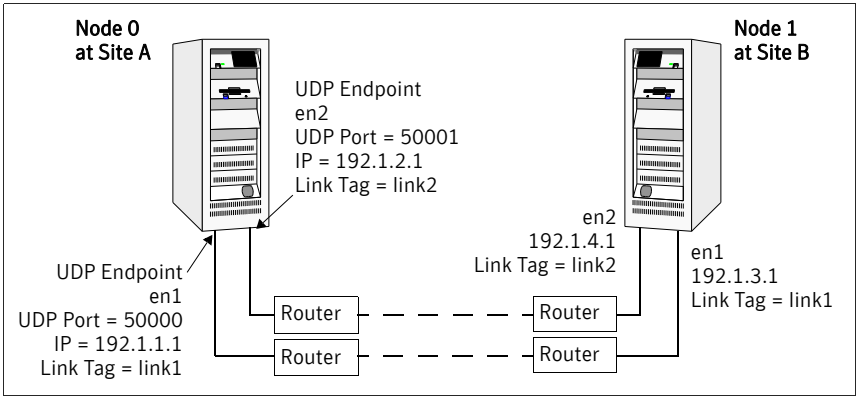
The file for Node 1 would resemble:

```
set-node Node1
set-cluster 1
#configure Links
#link <tag-name> <device> <node-range> <link-type> <udp port>
<MTU> <IP-address> <bcast-address>
link link1 /dev/xti/udp - udp 50000 - 192.1.2.2 192.1.2.255
link link2 /dev/xti/udp - udp 50001 - 192.1.3.2 192.1.3.255
```

Sample configuration: Links crossing IP routers

The following illustration depicts a typical configuration of links crossing an IP router employing LLT over UDP. The illustration shows just two nodes of a four-node cluster.

The configuration represented by the following `/etc/lltab` file for Node 1



has links crossing IP routers. Notice that IP addresses are shown for each link on each peer node. In this configuration broadcasts are disabled. Hence, the broadcast address does not need to be set in the in the `link` command of the `/etc/lltab` file.

```
set-node Node1
set-cluster 1

link link1 /dev/xti/udp - udp 50000 - 192.1.3.1 -
link link2 /dev/xti/udp - udp 50001 - 192.1.4.1 -

#set address of each link for all peer nodes in the cluster
#format: set-addr <node-id> <link tag-name> <address>
set-addr        0 link1 192.1.1.1
set-addr        0 link2 192.1.2.1
set-addr        2 link1 192.1.5.2
set-addr        2 link2 192.1.6.2
set-addr        3 link1 192.1.7.3
set-addr        3 link2 192.1.8.3
```

```
#disable LLT broadcasts
set-bcasthb     0
set-arp         0
```

The `/etc/lltab` file on Node 0 would resemble:

```
set-node Node0
set-cluster 1

link link1 /dev/xti/udp - udp 50000 - 192.1.1.1 -
link link2 /dev/xti/udp - udp 50001 - 192.1.2.1 -

#set address of each link for all peer nodes in the cluster
#format: set-addr <node-id> <link tag-name> <address>
set-addr        1 link1 192.1.3.1
set-addr        1 link2 192.1.4.1
set-addr        2 link1 192.1.5.2
set-addr        2 link2 192.1.6.2
set-addr        3 link1 192.1.7.3
set-addr        3 link2 192.1.8.3

#disable LLT broadcasts
set-bcasthb     0
set-arp         0
```

Minimal downtime upgrade

Use a minimal downtime upgrade to upgrade VCS. This procedure minimizes downtime for the cluster that you want to upgrade. In situations where you can fail over all your service groups to running nodes, downtime equals the time that it takes to offline and online the service groups. In situations where you have a service group that you cannot fail over to a running node during upgrade, downtime for that service group equals the time that it takes to perform an upgrade and reboot the node.

Supported upgrades

Use this procedure to upgrade from VCS 4.0 or 4.1.

Prerequisites for a minimal downtime upgrade

Before you start the upgrade, confirm that you have licenses for all the nodes that you plan to upgrade.

Planning for the minimal downtime upgrade

- Plan out the movement of the service groups from node to node in order to minimize the downtime for any particular service group.
- Some rough guidelines are:
  - Split the cluster in half. If the cluster has an odd number of nodes, calculate (n+1)/2, and start the upgrade with the even number of nodes.
  - Split the cluster so that your high priority service groups remain online during the upgrade of the first subcluster.

Minimal downtime upgrade limitations

The following limitations primarily describe not tampering with configurations or service groups during the minimum downtime upgrade.

- While you perform the upgrades, do not choose any configuration options.
- While you perform the upgrades, do not start any modules.
- When you start the installer, only select VCS.
- While you perform the upgrades, do not add or remove service groups to any of the nodes.
- Depending on your configuration, you may find that you cannot upgrade multiple nodes at the same time. You may only be able to upgrade one node at a time.
- For very large clusters, you might have to repeat these steps multiple times to upgrade your cluster.

Minimal downtime upgrade example

In this example, you have four nodes: node01, node02, node03, and node04. You also have four service groups: sg1, sg2, sg3, and sg4. Each service group is running on one node.

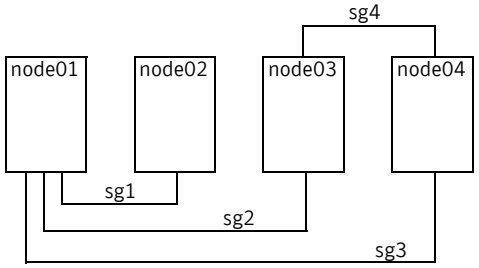
- node01 runs sg2.
- node02 runs sg1.
- node03 runs sg4.
- node04 runs sg3.

In your system list, you have each service group failing over to one other node.

- sg1 can fail over between node01 and node02.
- sg2 can fail over between node01 and node03.

- sg3 can fail over between node01 and node04.
- sg4 can fail over between node03 and node04.

Figure A-2 Four nodes, four service groups, and their failover paths



Minimal downtime example overview

This example presumes that you have at least one service group (in this case sg3), that cannot stay online on both nodes during the upgrade. In this situation, it is best if sg3 is a low-priority service group. The cluster is split with node02 and node03 together for the first upgrade, and node01 and node04 together for the next upgrade.

You switch sg1 to run on node01. Switch sg4 to run on node04. You then perform the upgrade on node02 and node03. When you finish the upgrade on node02 and node03, you need to upgrade node01 and node04.

Your cluster is down when you stop HAD on node01 and node04, but have not yet started node02 and node03.

You have to take your service groups offline manually on node01 and node04. When you start node02 and node03, the service groups come online. Reboot node01 and node04 when the upgrade completes. They then rejoin the cluster and you can balance the load on machines by switching service groups.

Performing the minimal downtime example upgrade

This upgrade uses four nodes with four service groups—note that in this scenario the service groups cannot stay online for part of the upgrade. Remember to not add, remove, or change resources or service groups on any nodes during the upgrade as these changes are likely to get lost after the upgrade.

To establish running service groups

1 Establish where your service groups are online.

```
# hagrp -state
#Group       Attribute        System      Value
 sg1          State            node01      |OFFLINE|
 sg1          State            node02      |ONLINE|
 sg2          State            node01      |OFFLINE|
 sg2          State            node03      |ONLINE|
 sg3          State            node01      |OFFLINE|
 sg3          State            node04      |ONLINE|
 sg4          State            node03      |ONLINE|
 sg4          State            node04      |OFFLINE|
```

2 Switch the service groups from all the nodes that you are first upgrading (node02 and node03) to the remaining nodes (node01 and node04).

```
# hagrp -switch sg1 -to node01
# hagrp -switch sg2 -to node01
# hagrp -switch sg4 -to node04
```

3 Verify that your service groups are offline on the nodes targeted for upgrade.

```
# hagrp -state
#Group       Attribute         System     Value
 sg1          State             node01     |ONLINE|
 sg1          State             node02     |OFFLINE|
 sg2          State             node01     |ONLINE|
 sg2          State             node03     |OFFLINE|
 sg3          State             node01     |OFFLINE|
 sg3          State             node04     |ONLINE|
 sg4          State             node03     |OFFLINE|
 sg4          State             node04     |ONLINE|
```

During the next procedure, do not perform any configuration tasks. Do not start any modules.

To perform the minimum downtime upgrade on target nodes

1 On the target nodes, start the 5.0 installer for VCS.

2 Select the VCS installation.

3 Answer **n** when the installer asks:

```
Do you want to upgrade to version 5.0 on these systems using
the current configuration? [y,n,q,?] (y) n
```

4 Answer with the names of the nodes that you want to upgrade:

```
Enter the system names separated by spaces on which to install
VCS: node02 node03
```

5 Select either option **1** or **2** when the installer asks:

```
Select the packages to be installed on all systems? 2
```

6 Answer **n** when the installer completes and asks:

```
Do you want to start Veritas Cluster Server processes now?
[y,n,q] (y) n
```

To edit the configuration and prepare for upgrade node01 and node04

1 When HAD is down on node02 and node03, you see this message:

```
Shutdown completed successfully on all systems.
```

2 After you see the above message, you can make the VCS configuration writable on node01 or node04. Note that you need to make the configuration writable because the installer froze the service groups during the upgrade.

```
# haconf -makerw
```

3 Unfreeze all service groups.

```
# hagrp -unfreeze sg1 -persistent
# hagrp -unfreeze sg2 -persistent
# hagrp -unfreeze sg3 -persistent
# hagrp -unfreeze sg4 -persistent
```

4 Dump the configuration and make it read-only.

```
# haconf -dump -makero
```

To edit the configuration on node02 and node03

1 Open the main.cf file, and delete the `Frozen = 1` line for each service group as appropriate.

2 Save and close the file.

3 Reboot node02 and node03.

4 Wait for GAB to come up. In the console's output, look for a line that reads:

```
Starting GAB is done.
```

To upgrade and restart your clusters

1 On node01 and node04, take the service groups offline.

```
# hagrp -offline sg1 -sys node01
# hagrp -offline sg2 -sys node01
# hagrp -offline sg3 -sys node04
# hagrp -offline sg4 -sys node04
```

2 On node01 and node04, perform the upgrade.
See "To perform the minimum downtime upgrade on target nodes" on page 213.

3 When HAD is down on node01 and node04, you see this message:

```
Shutdown completed successfully on all systems.
```

4 Start vxfenconfig on node02 and node03.

```
# vxfenconfig -c
```

5 Start your cluster on node02 and node03.

```
# hastart
```

6 After the upgrade completes, reboot node01 and node04.

After you have rebooted the nodes, all four nodes now run the latest version of VCS.

In this example, you achieved minimal downtime because your service groups were down only from the point when you took them offline on node01 and node04, to the time VCS brought them online on node02 or node03 as appropriate.

Setting up a trust relationship between two authentication brokers

This procedure is a general prerequisite to add secure direct connection clusters to a management server or a peer management server.

To set up the trust relationship

1 Identify which two systems with authentication brokers are to participate in the trust relationship.

To set up a peer management server, these systems are:

- The local management server host
- The remote management server host

For adding secure direct connection clusters, these systems are:

- The system that hosts the authentication broker used by the cluster (can be a cluster node in the cluster)
- The local management server host

2 On one of the two systems, run the following command (the dashes preceding the command options are double dashes):

```
# vssat setuptrust --broker systemname:2821 --securitylevel low
```

Where systemname is the DNS server name or the IP address of the second (other) system.

3 On the second (other) system, obtain a command prompt and run the following command:

```
vssat setuptrust --broker systemname:2821 --securitylevel low
```

Where systemname is the DNS server name or the IP address of the first system.

If you are adding secure direct connection clusters, you are finished with this procedure.

If you are adding a peer management server, you must continue with the following steps:

4 On both systems, obtain a command prompt and run the following command (the dashes in steps 4–6 are single dashes):

```
# gaserver -list
```

This command returns the ID, system name, and address of the system that runs the command. Record these data for both systems.

5 On the first system, run the following command:

```
# gaserver -add ID systemname address [port]
```

Where ID, systemname, and address are the ID, system name, and IP address of the second (other) system, and port is the default Cluster Management Console port, 14145.

6 On the second (other) system, obtain a command prompt and run the following command:

```
# gaserver -add ID systemname address [port]
```

Where ID, systemname, and address are the ID, system name, and IP address of the first system, and port is the default Cluster Management Console port, 14145.

7 To verify the peer management server, run the gaserver -list command on each management server host. If both command runs return data for both systems, the peer management server is configured successfully.

Appendix B

Sample VCS installation and configuration output

This appendix contains the following topics:

About sample VCS installation and configuration

The sample installation involves installing VCS with all the optional features on two systems, north and south. Make sure that you performed the pre-installation tasks.

Installing the Root Broker

The Root Broker administrator must perform this task before you configure the cluster in secure mode or configure Cluster Connector for centralized management of clusters.

See "Preparing to install VCS 5.0" on page 28.

```
# cd cluster_server

# ./installvcs -security

        Veritas Cluster Server 5.0 Installation Program
```

```
[3] Install Symantec Product Authentication Service Root Broker.


Select the Security option you would like to perform [1-3,q] 3

Enter the system name on which to install VxSS: east

Initial system check:

Checking rsh communication with east..................... AIX 5.3
Checking VxSS installation on east ................ not installed

          Veritas Cluster Server 5.0 Installation Program

Checking installed filesets on east

          Veritas Cluster Server 5.0 Installation Program

The following VxSS filesets will be installed:
VRTSperl     Veritas Perl 5.8.8 Redistribution
VRTSicsco    Symantec Infrastructure Core Services Common
VRTSpbx      Symantec Private Branch Exchange
VRTSat       Symantec Product Authentication Service

          Veritas Cluster Server 5.0 Installation Program

Installing VxSS: 0%

Installing VxSS: 100%

          Veritas Cluster Server 5.0 Installation Program

Installation completed successfully on all systems


It is optional to configure VxSS now. If you choose to configure
VxSS later, you can either do so manually or run the installvcs -
configure command.

Are you ready to configure VxSS? [y,n,q] (y)

Enter password for Root Broker administrator for the Root Broker on
host venus

Password must contain at least 5 characters.
Please enter a new password or <Control-C> to quit.

Enter password for Authentication Broker administrator for the
Authentication Broker on host venus
```

```
Do you want to start Symantec Product Authentication Service
processes now? [y,n,q] (y)

          Veritas Cluster Server 5.0 Installation Program

Starting VxSS: 0%

Starting VxSS: 100%

Startup completed successfully on all systems
```

Installing the Cluster Management Console Management Server

The Cluster Management Console Management Server administrator must set up the Management Server before you configure this cluster for centralized management.

```
Installation Program

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slogans are trademarks or registered trademarks of Symantec
Corporation in the United States and certain other countries.
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acknowledged.

Logs for installer are being created in /var/tmp/installer-xxxxxx.


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Symantec Product Version Installed   Licensed
============================================

Symantec Licensing Utilities are not installed. Unable to determine
product installation status.

Task Menu:

I) Install/Upgrade a Product    C) Configure an Installed Product
L) License a Product            P) Perform a PreinstallationCheck
U) Uninstall a Product          D) View a Product Description
Q) Quit                         ?) Help
```

```
Enter a Task: [I,C,L,P,U,D,Q,?] i

       Storage Foundation and High Availability Solutions 5.0

     1)  Veritas Cluster Server
     2)  Veritas File System
     3)  Veritas Volume Manager
     4)  Veritas Volume Replicator
     5)  Veritas Storage Foundation
     6)  Veritas Storage Foundation for Oracle
     7)  Veritas Storage Foundation for DB2
     8)  Veritas Storage Foundation for Sybase
     9)  Veritas Storage Foundation for Cluster File System
    10)  Veritas Storage Foundation for Oracle RAC
    11)  Veritas Cluster Management Console
    12)  Web Server for Storage Foundation Host Management
    13)  Symantec Product Authentication Service
     b)  Back to previous menu

Select a product to install: [1-13,b,q] 11


       Storage Foundation and High Availability Solutions 5.0

Veritas Cluster Management Console component information and
configuration:

Read the following component descriptions and choose the appropriate
target.

Management Server:

The Management Server is the CMC component that manages your
clusters.

Cluster Connector:

The Cluster Connector is the CMC component that acts as an agent to
your clusters.

     1)  Management Server
     2)  Cluster Connector

Enter '1' to install the Management Server, '2' to install the
Cluster Connector: [1-2,q] (1) 1

Setup will install the Management Server.

Is this information correct? [y,n,q] (y)

Initial system check:
```

```
Checking CMC installation on venus ................... not installed


        Storage Foundation and High Availability Solutions 5.0

Checking installed packages on venus

.
.

        Storage Foundation and High Availability Solutions 5.0

installer will install the following CMC packages:
VRTSat        Symantec Product Authentication Service
VRTSperl      Veritas Perl 5.8.8 Redistribution
VRTSdbms3     Symantec Shared DBMS
VRTSjre15     Veritas Java Runtime Environment Redistribution
VRTSweb       Veritas Java Web Server
VRTScmcm      Veritas Cluster Management Console
VRTScmcdc     Veritas Cluster Management Console Documentation

Press [Return] to continue:
It is possible to install CMC packages without performing
configuration.

It is optional to configure CMC now. If you choose to configure CMC
later, you can either do so manually or run the installcmc -
configure command.

Are you ready to configure CMC? [y,n,q] (y)


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The following information is required to configure the Management
Server:

        A unique Management Server display name
        A unique Management Server address
        The desired location of the Management Server database

        The name of the user that will be the initial administrator

        A service account password

        Optionally, the address of a remote root broker

Enter a unique management server display name: [?] venus_cmc_ms
Enter the network address used by the management server [b,?]
(venus.symantecexample.com) venus.symantecexample.com
```

```
Enter the desired location of the database to be used by the
management server [b,?] (/opt/VRTScmc/db) /opt/VRTScmc/db


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Management Server configuration verification:

        Management Server Display Name: venus_cmc_ms
        Management Server Address: venus.symantecexample.com
        Database location: /opt/VRTScmc/db

Is this information correct? [y,n,q,b] (y)


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Veritas Cluster Management Console initial admin user configuration:

Read the following user selection descriptions and choose the
appropriate method.

Local User:

Configure a user on the local machine as the initial admin user.

Custom User:

Configure a user manually.

     1)  Local User
     2)  Custom User

Enter '1' to enter the name of a local user, '2' to set up a custom
user: [1-2,q] (1) 1


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Local admin user selection:

To log in to the CMC Management Server, enter the name of a local
user to be set as the administrator. The domain and domain type will
be automatically selected for you.

Enter the initial management server user name: [b,?] (root) root


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Management Server admin user verification:
```

```
        Management Server User Name: root

Is this information correct? [y,n,q,b] (y)


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Set Veritas Cluster Management Console Management Server service
account password:

The CMC Management Server creates a service account for secure
communication between it and any managed clusters.

Enter a password for the CMC service account:

Confirm the password you entered for the CMC service account:


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Do you want to specify a remote root broker? [y,n,q,b,?] (n) n


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Installing CMC: 0%
.
.
Installing CMC: 100%

Installation completed successfully on all systems


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Creating Management Server configuration file ..............  Done

Creating CMC service account and domain for secure communication:

    Creating service account private domain ..................  Done
    Creating service account..................................  Done
    Creating CLI service account..............................  Done
    Authenticating the account CMC_CLI with the broker ....  success

Do you want to start Veritas Cluster Management Console processes
now? [y,n,q,b] (y)


    Starting CMC: 0%
    .
    .
    Starting CMC: 100%
```

```
Startup completed successfully on all systems


        Storage Foundation and High Availability Solutions 5.0

A string of five or more characters is required to encrypt passwords
in the responsefile

Enter five or more characters to be used an encryption key: [b]
password

This key must be retained in a secure file and referenced using the
-enckeyfile option if the generated responsefile is to be used
again.

Press [Return] to continue:
Installation log files, summary file, and response file are saved
at:

        /opt/VRTS/install/logs/installer-xxxxxx

Initial admin user info:
        Management Server User Name: root
        Management Server User Domain: venus.symantecexample.com
        Management Server User Domain Type: unixpwd
```

Installing VCS 5.0

In this sample installation, the installation program installs VCS filesets on two nodes, north and south.

- Start the product installer or the installvcs program
- Installer performs initial system checks
- License VCS
- Installer checks for installed filesets
- Choose to install all VCS filesets or required filesets
- Installer lists the filesets

Start the product installer or the installvcs program

To start the product installer

```
# ./installer

Install/Upgrade a product I
```

Veritas Cluster Server

```
        Veritas Cluster Server 5.0 Installation Program
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"commercial computer software" and "commercial computer software
documentation" as defined in FAR Sections 12.212 and DFARS
Section 227.7202.

Logs for installvcs are being created in /var/tmp/installvcs-
xxxxxx.

Enter the system names separated by spaces on which to install
VCS: north south
```

To start the installvcs program

```
# cd /cluster_server
# ./installvcs

        Veritas Cluster Server 5.0 Installation Program

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"commercial computer software" and "commercial computer software
documentation" as defined in FAR Sections 12.212 and DFARS
Section 227.7202.

Logs for installvcs are being created in /var/tmp/installvcs-
xxxxxx.

Enter the system names separated by spaces on which to install
VCS: north south
```

Installer performs initial system checks

```
Initial system check:

Checking rsh communication with south .................. AIX 5.3
Checking VCS installation on north ................ not installed
Checking VCS installation on south ................ not installed
```

License VCS

```
Checking system licensing

Installing licensing filesets

VCS is not licensed on north

Enter a VCS license key for north: XXXX-XXXX-XXXX-XXXX-XXX
XXXX-XXXX-XXXX-XXXX-XXX successfully registered on north
VCS license registered on north

Do you want to enter another license key for north? [y,n,q] (n)
XXXX-XXXX-XXXX-XXXX-XXX successfully registered on south
VCS license registered on south

Do you want to enter another license key for south? [y,n,q] (n)
```

Installer checks for installed filesets

```
Checking installed filesets on north
Checking installed filesets on south
```

Choose to install all VCS filesets or required filesets

```
VCS can be installed without optional filesets to conserve
diskspace.

Additional filesets are typically installed to simplify future
upgrades.

1)  Required Veritas Cluster Server filesets - 531 MB required
2)  All Veritas Cluster Server filesets - 633 MB required
3)  Storage Foundation Enterprise HA filesets - 1114 MB required
Select the filesets to be installed on all systems? [1-3,q,?]
(3) 3
```

Installer lists the filesets

```
The following VCS filesets will be installed:
VRTSperl.rte     Veritas Perl 5.8.8 Redistribution
VRTSvlic         Veritas Licensing
VRTSicsco        Symantec Common Infrastructure
VRTSpbx          Symantec Private Branch Exchange
VRTSsmf          Symantec Service Management Framework
VRTSat           Symantec Product Authentication Service
VRTSspt          Veritas Software Support Tools
SYMClma          Symantec License Inventory Agent
```

```
VRTSveki          Veritas Kernel Interface
VRTSllt.rte       Veritas Low Latency Transport
VRTSgab.rte       Veritas Group Membership and Atomic Broadcast
VRTSvxfen.rte     Veritas I/O Fencing
VRTSvcs.rte       Veritas Cluster Server
VRTSvcsag.rte     Veritas Cluster Server Bundled Agents
VRTSvcs.msg.en_US Veritas Cluster Server Message Catalogs
VRTSvcs.man       Veritas Cluster Server Man Pages
VRTSvcs.doc       Veritas Cluster Server Documentation
VRTSjre15.rte     Veritas Java Runtime Environment Redistribution
VRTScutil.rte     Veritas Cluster Utilities

Press [Return] to continue:

...continued:
VRTScssim.rte     Veritas Cluster Server Simulator
VRTScscw.rte      Veritas Cluster Server Configuration Wizards
VRTSweb.rte       Veritas Java Web Server
VRTScscm.rte      Veritas Cluster Server Cluster Manager
VRTSacclib.rte    Veritas ACC Library
VRTScmcs.rte      Veritas Cluster Management Console for single
cluster environments
VRTScmccc.rte     Veritas Cluster Management Console cluster
connector
VRTSobc33         Veritas Enterprise Administrator Core Service
VRTSob            Veritas Enterprise Administrator Service
VRTSobgui         Veritas Enterprise Administrator
VRTSccg         Veritas Enterprise Administrator Central Control
Grid
VRTSmh            Veritas Storage Foundation Managed Host by
Symantec
VRTSaa            Veritas Enterprise Administrator Action Agent
VRTSvxvm          Veritas Volume Manager Binaries
VRTSdsa           Veritas Datacenter Storage Agent
VRTSfspro       Veritas File System Management Services Provider
VRTSvmman         Veritas Volume Manager Manual Pages
VRTSvmdoc         Veritas Volume Manager Documentation
VRTSdcli          Veritas Distributed Command Line Interface
VRTSvmpro         Veritas Volume Manager Management Services
Provider

Press [Return] to continue:

...continued:
VRTSvsvc          Veritas Volume Server and Client Provider
VRTSalloc         Veritas Volume Manager Intelligent Storage
Provisioning
VRTSvdid.rte      Veritas Device Identification API
VRTSddlpr       Veritas Device Discovery Layer Services Provider
VRTSvrpro         Veritas Volume Replicator Client Extension and
Provider for
               Veritas Enterprise Administrator
```

```
VRTSvcsvr        Veritas Cluster Server Agents for VVR
VRTSvrw          Veritas Volume Replicator Web Console
VRTSvrdoc        Veritas Volume Replicator Documentation
VRTSvxfs         Veritas File System
VRTSfsman        Veritas File System Manual Pages
VRTSfsdoc        Veritas File System Documentation
VRTSfssdk        Veritas File System Software Developer Kit
VRTSfsmnd        Veritas File System Software Developer Kit
Manual Pages
VRTSvxmsa        Veritas Mapping Service, Application Libraries
VRTSvail.VRTSvail Veritas Array Integration Layer
VRTSmapro        Veritas Storage Foundation GUI for Mapping
VRTSgapms.VRTSgapms Veritas Generic Array Plugin


It is possible to install VCS filesets without performing
configuration.
```

Configuring VCS 5.0

You can proceed to configure VCS now or allow to install the VCS filesets and then configure VCS at a later time.

```
It is optional to configure VCS now. If you choose to configure
VCS later, you can either do so manually or run the
installvcs -configure command.

Are you ready to configure VCS? [y,n,q] (y) y

To configure VCS, please answer the following sets of questions.

When a [b] is presented after a question, 'b' may be entered to
go back to the first question of the configuration set.

When a [?] is presented after a question, '?' may be entered for
help or additional information about the question.

Following each set of questions, the information you have
entered will be presented for confirmation. To repeat the set of
questions and correct any previous errors, enter 'n' at the
confirmation prompt.

No configuration changes are made to the systems until all
configuration questions are completed and VCS is installed
successfully.
```

Perform the following tasks as the installer takes you through different screens:

- Configure the cluster
- Configure the cluster in secure mode

- Add VCS users
- Configure Cluster Management Console
- Configure cluster connector
- Configure SMTP email notification
- Configure SNMP trap notification
- Configure the global cluster option
- Installer installs the VCS filesets
- Installer creates VCS configuration files
- Start VCS
- Complete the installation

Configure the cluster

```
To configure VCS the following information is required:

A unique Cluster name
A unique Cluster ID number between 0-65535
Two or more NIC cards per system used for heartbeat links

One or more heartbeat links are configured as private links
One heartbeat link may be configured as a low priority link

All systems are being configured to create one cluster

Enter the unique cluster name: [?] vcs_cluster2
Enter the unique Cluster ID number between 0-65535: [b,?] 7

Discovering NICs on north ...discovered en0 en1 en2 en3 en4

Enter the NIC for the first private heartbeat NIC on north:
[b,?] en2
Would you like to configure a second private heartbeat link?
[y,n,q,b,?] (y)
Enter the NIC for the second private heartbeat NIC on north:
[b,?] en3
Would you like to configure a third private heartbeat link?
[y,n,q,b,?](n)
Do you want to configure an additional low priority heartbeat
link? [y,n,q,b,?] (n)

Are you using the same NICs for private heartbeat links on all
systems? [y,n,q,b,?] (y)

Checking Media Speed for en1 on north ........ Auto negotiation
Checking Media Speed for en2 on north ........ Auto negotiation
```

```
Checking Media Speed for en1 on south ........ Auto negotiation
Checking Media Speed for en2 on south ........ Auto negotiation
Cluster information verification:

 Cluster Name: vcs_cluster2
 Cluster ID Number: 7
 Private Heartbeat NICs for north: link1=en2 link2=en3
 Private Heartbeat NICs for south: link1=en2 link2=en3
Is this information correct? [y,n,q] (y)
```

Configure the cluster in secure mode

```
Veritas Cluster Server can be configured to utilize Symantec
Security Services.

Running VCS in Secure Mode guarantees that all inter-system
communication is encrypted and that users are verified with
security credentials.

When running VCS in Secure Mode, NIS and system usernames and
passwords are used to verify identity.  VCS usernames and
passwords are no longer utilized when a cluster is running in
Secure Mode.

Before configuring a cluster to operate using Symantec Security
Services, another system must already have Symantec Security
Services installed and be operating as a Root Broker. Refer to
the Veritas Cluster Server Installation Guide for more
information on configuring a VxSS Root Broker.

Would you like to configure VCS to use Symantec Security
Services? [y,n,q] (n) y
```

If the VRTSat fileset is already installed, the installer provides you different modes to configure the cluster in secure mode.

```
Security can be configured completely automatically by the
installer or it can also be configured semi automatically. In
automatic mode, no user intervention is required. In the semi
automatic mode, Authentication Broker related setup on Root
Broker is expected to be performed by the Root Broker
Administrator and CPI will ask for certain information that will
be used to configure Authentication Brokers.

Security Menu

1) Configure security completely automatically
2) Provide AB credentials using BLOBs
3) Provide AB credentials without using BLOBs

Select the Security option you would like to perform [1-3,q,?]
(1)
```

Depending on the menu option you choose, the installer prompts you to select the configuration mode.

- Configuring security automatically
- Configuring security semiautomatically using encrypted files
- Configuring security semiautomatically answering prompts

Configuring security automatically

```
Select the Security option you would like to perform [1-3,q,?]
(1) 1

In order to enable Symantec Security Services on a VCS Cluster,
Veritas Authentication Services (VRTSat rpm) must be installed
on a system and operating as a Root Broker.  Refer to the Veritas
Cluster Server Installation Guide for more information on
installing and configuring Veritas Authorization Services.

Enter the name of the VxSS Root Broker system: east

Checking ssh communication with venus .................. AIX 5.3
Checking vxatd process ................................. running
Checking vxatd version ................................. 4.3.13.0
Checking security domain ........ root@venus.symantecexample.com

Systems will use root@east.symantecexample.com as its VxSS
Domain
```

Configuring security semiautomatically using encrypted files

Make sure that you completed the pre-configuration tasks.

See "Preparing to install VCS 5.0" on page 28.

```
Select the Security option you would like to perform [1-3,q,?]
(1) 2

You need to create AB account for each cluster node on the Root
Broker. Also you need to create a BLOB per cluster node. Please
verify that the version of VRTSat installed on root broker
supports BLOB creating.  You need to use --in option to create
BLOBs. Make sure that the input file is in the following format:

[setuptrust]
broker=<root_broker>
hash=<root_hash>
securitylevel=high

[configab]
identity=<ab_identity>
```

```
password=<ab_password>
root_domain=<root_FQDN>
root_broker=<root_broker>:<root_broker_port>
broker_admin_password=<root_broker_admin_password>
start_broker=false
enable_pbx=false

Refer to the VxSS Documentation for steps to create BLOBs. CPI
needs a locally accessible path for BLOBs.  You can either copy
the BLOBs on north or mount the BLOBs using some removable
media.

Do you want to continue? [y,n,q,b] (y)
Enter the path of BLOB for north: [b]/root/blob.north

Enter the path of BLOB for south: [b]/root/blob.south
```

Configuring security semiautomatically answering prompts

Make sure that you completed the pre-configuration tasks.

See "Preparing to install VCS 5.0" on page 28.

```
Select the Security option you would like to perform [1-3,q,?]
(1) 3

        Veritas Cluster Server 5.0 Installation Program

You need to create authentication broker principal for each
cluster node on the Root Broker. Refer to the VxSS Documentation
for the configuration steps.  Also make sure that the root_hash
file is either copied to the installer node or it is locally
accessible (via mounted file system or any other means). CPI
will ask for the locally accessible path of root_hash file. You
also need the AB principal passwords.

Press 'b' anytime (expect when prompted for passwords) to go to
the previous menu.

Press [Return] to continue:

Enter root broker name: [b] east.symantecexample.com
Enter root broker FQDN: [b] (symantecexample.com)
Enter root broker domain: [b] (root@east.symantecexample.com)
Enter root broker port: [b] (2821)
Enter path to the locally accessible root hash [b]
(/var/tmp/installvcs-1Lcljr/root_hash)
Enter authentication broker principal name on north [b]
(north.symantecexample.com)
Enter authentication broker password on north:
Enter authentication broker principal name on south [b]
(south.symantecexample.com)
Enter authentication broker password on south:
```

Proceed to configure Cluster Management Console.

See "Configure Cluster Management Console" on page 234.

Add VCS users

If you have enabled Symantec Product Authentication Service, you need not add VCS users now. Proceed to configure the Cluster Management Console.

See "Configure cluster connector" on page 233.

```
The following information is required to add VCS users:

A user name
A password for the user
User privileges (Administrator, Operator, or Guest)

Do you want to set the password for the Admin user
(default password='password')? [y,n,q] (n) y

Enter New Password:******

Enter Again:******

Do you want to add another user to the cluster? [y,n,q] (y) y

Enter the user name: [?] smith
Enter New Password:*******

Enter Again:*******
Enter the privilege for user smith (A=Administrator, O=Operator,
G=Guest): [?] a

Would you like to add another user? [y,n,q] (n) n

User: admin     Privilege: Administrators
User: smith     Privilege: Administrators
Passwords are not displayed

Is this information correct? [y,n,q] (y)
```

Configure cluster connector

```
        Veritas Cluster Server 5.0 Configuration Program

Setup will now configure Veritas Cluster Management Console. If
you have configured a management server, you can configure the
cluster to be managed by the management server. You can also
configure Veritas Cluster Management Console on cluster nodes to
manage the local cluster.
```

```
Do you want this cluster to be managed by a management server?
Enter 'y' if you have set up a management server. [y,n,q] (y) y

To configure the CMC Cluster Connector, the following is
required:

The Management Server address

Enter the network address used by the management server [?]
(north) mgmtserver1.symantecexample.com

Management Server Address: mgmtserver1.symantecexample.com

Is this information correct? [y,n,q] (y) y

        Veritas Cluster Server 5.0 Configuration Program

The following information is required to set up secure
communication with the CMC management server:

Password for the service account created during the management
server install (CMC_CC@CMC_SERVICES)

Hash of CMC management server's root broker. See the Veritas
Cluster Server Installation Guide for information on how to
retrieve the hash.

Enter the password for the CMC service account:

Enter the hash of the management server's root broker [?]
e96148d6ad9ea37b9b6a13f35512cb006a75be04

Root broker hash: e96148d6ad9ea37b9b6a13f35512cb006a75be04

Is this information correct? [y,n,q] (y) y
```

Configure Cluster Management Console

```
The following information is required to configure the Cluster
Management Console:

A public NIC used by each system in the cluster
A Virtual IP address and netmask for the Cluster Management
Console

Do you want to configure the Cluster Management Console [y,n,q]
(y) y
Active NIC devices discovered on north: en0
Enter the NIC for Cluster Manager (Web Console) to use on north:
[b,?] (en0)
```

```
Is en0 to be the public NIC used by all systems [y,n,q,b,?] (y) y

Enter the Virtual IP address for Cluster Manager: [b,?]
10.10.12.1
Enter the netmask for IP 10.10.12.1: [b,?] (255.255.240.0)
        Veritas Cluster Server 5.0 Configuration Program

Cluster Management Console verification:

NIC: en0
IP: 10.10.12.1
Netmask: 255.255.240.0

Is this information correct? [y,n,q] (y) y
```

Configure SMTP email notification

```
        Veritas Cluster Server 5.0 Configuration Program

The following information is required to configure SMTP
notification:

The domain-based hostname of the SMTP server
The email address of each SMTP recipient
A minimum severity level of messages to send to each recipient

Do you want to configure SMTP email notification
[y,n,q](Y) y

Enter the domain-based hostname of the SMTP server
(example: smtp.yourcompany.com): [b,?] smtp.symantecexample.com
Enter the full email address of the SMTP recipient
(example: user@yourcompany.com): [b,?] ozzie@symantecexample.com
Enter the minimum severity of events for which mail should be
sent to ozzie@symantecexample.com  [I=Information, W=Warning,
E=Error, S=SevereError]: [b,?] w

Would you like to add another SMTP recipient? [y,n,q,b] (n) y

Enter the full email address of the SMTP recipient
(example: user@yourcompany.com): [b,?]
harriet@symantecexample.com

Enter the minimum severity of events for which mail should be
sent to harriet@symantecexample.com  [I=Information, W=Warning,
E=Error, S=SevereError]: [b,?] E

Would you like to add another SMTP recipient? [y,n,q,b] (n) n

        Veritas Cluster Server 5.0 Configuration Program
```

```
SMTP email notification verfication

SMTP Address: smtp.symantecexample.com
Recipient: ozzie@symantecexample.com receives email for Warning
or higher events
Recipient: harriet@symantecexample.com receives email for Error
or higher events

Is this information correct? [y,n,q] (y)
```

Configure SNMP trap notification

```
        Veritas Cluster Server 5.0 Configuration Program

System names of SNMP consoles to receive VCS trap messages
SNMP trap daemon port numbers for each console
A minimum severity level of messages to send to each console

Enter the SNMP trap daemon port: [b,?] (162)
Enter the SNMP console system name: [b,?] saturn
Enter the minimum severity of events for which SNMP traps
should be sent to saturn [I=Information, W=Warning, E=Error,
S=SevereError]: [b,?] E

    Would you like to add another SNMP console? [y,n,q,b] (n) y
    Enter the SNMP console system name: [b,?] jupiter
    Enter the minimum severity of events for which SNMP traps
    should be sent to jupiter [I=Information, W=Warning,
    E=Error, S=SevereError]: [b,?] S

    Would you like to add another SNMP console? [y,n,q,b] (n)

        Veritas Cluster Server 5.0 Configuration Program

    SNMP Port: 162
    Console: saturn receives SNMP traps for Error or
    higher events
    Console: jupiter receives SNMP traps for SevereError or
    higher events

    Is this information correct? [y,n,q] (y)
```

Configure the global cluster option

```
        Veritas Cluster Server 5.0 Configuration Program

The following is required to configure the Global Cluster
Option:

    A public NIC used by each system in the cluster
```

```
    A Virtual IP address and netmask

The Virtual IP address and NIC may be the same as those
configured for Cluster Management Console

    Do you want to configure the Global Cluster Option? [y,n,q]
    (y)


Do you want to configure the Global Cluster Option? [y,n,q] (y)
y

Active NIC devices discovered on north: en0
Enter the NIC for Global Cluster Option to use on north: [b,?]
(en0)
Is en0 to be the public NIC used by all systems [y,n,q,b,?] (y) y
Enter the Virtual IP address for the Global Cluster Option:
[b,?] 10.10.12.1
Enter the netmask for IP 10.10.12.1: [b,?] (255.255.240.0)

        Veritas Cluster Server 5.0 Configuration Program

Global Cluster Option configuration verification:

NIC: en0
IP: 10.10.12.1
Netmask: 255.255.240.0

Is this information correct? [y,n,q] (y) y
```

Installer installs the VCS filesets

```
        Veritas Cluster Server 5.0 Configuration Program

Installing VCS: 0%


        Veritas Cluster Server 5.0 Configuration Program

Installing VCS: 100%

Installation completed successfully on all systems
```

Installer creates VCS configuration files

```
Creating north security principal on venus ............... Done
Starting Veritas Security Services on north ............... Done
Creating south security principal on venus ............... Done
Starting Veritas Security Services on south ............... Done
```

```
Authenticating and deploying CMC service account from north:
Setting up trust with the broker venus.symantecexample.com
.................................................. success
Authenticating the account CMC_CC with the broker... success

Deploying authentication package to south:
Creating package for south ........................... Done
Copying package to south ............................. Done
Extracting package on south .......................... Done

Creating Cluster Server configuration files ............ Done
Copying configuration files to north..................... Done
Copying configuration files to south..................... Done

Cluster Server configured successfully.
```

Start VCS

```
Do you want to start Cluster Server processes now? [y,n,q] (y) y

Veritas Cluster Server 5.0 Installation Program

Starting VCS: 0%


Veritas Cluster Server 5.0 Installation Program

Starting VCS: 100%


Startup completed successfully on all systems

Press [Return] to continue:
```

Complete the installation

```
Installation log files, summary file, and response file are
saved at:

        /opt/VRTS/install/logs/installvcs-xxxxxx

When installvcs installs software, some software may be applied
rather than committed. It is the responsibility of the system
administrator to commit the software, which can be performed
later with the -c option of the installp command.
```

Uninstalling VCS 5.0

```
# cd /opt/VRTS/install
# ./uninstallvcs

        Veritas Cluster Server 5.0 Installation Program

Logs for uninstallvcs are being created in /var/tmp/
uninstallvcs-6flUca.

VCS configuration files exist on this system with the following
information:

    Cluster Name: VCS_cluster2
    Cluster ID Number: 7
    Systems: north south
    Service Groups: ClusterService groupA groupB

Do you want to uninstall VCS from these systems? [y,n,q] (y) y

        Veritas Cluster Server 5.0 Installation Program

Initial system check:

Checking rsh communication with south ..... AIX 5.3.0

Checking system licensing

        Veritas Cluster Server 5.0 Installation Program

Checking installed filesets on north
Checking installed filesets on south
uninstallvcs is now ready to uninstall VCS.
All VCS processes that are currently running must be stopped.

Are you sure you want to uninstall VCS? [y,n,q] (y) y

        Veritas Cluster Server 5.0 Installation Program

Uninstalling VCS: 100%

Uninstall completed successfully on all systems

Uninstallation log files, summary file, and response file are
saved at:

        /opt/VRTS/install/logs/uninstallvcs-7DAaUt
```

Appendix C

Configuring the Symantec License Inventory Agent

This appendix includes the following topics:

The Symantec License Inventory Manager installation disc is available separately. For information on how to order the full product, see "How to order the Symantec License Inventory Manager license and media kit" on page 245. The installation media provides online documentation with details on all topics discussed in this appendix.

Read the following Technical Support TechNote for the latest information on updates, patches, and software issues regarding this product:

http://support.veritas.com/docs/282183

You can also download the *Symantec License Inventory Agent 4.1 Release Notes*, from this website.

About the Symantec License Inventory Manager

The Symantec License Inventory Manager (license inventory manager) is an enterprise asset management tracking tool that inventories Symantec Information Availability products in your network and consolidates critical information on the deployment of these products to facilitate license management and compliance tracking. Using the information provided by the license inventory manager, you can:

- Determine all the Symantec software products and licenses being used in your enterprise
- Achieve easier license self-compliance management
- Know your Enterprise License Agreement deployment status
- Reduce administrative overhead for managing license compliance
- Renew support and maintenance based on the licenses you have deployed
- Gain more control over your Symantec software usage
- Manage department chargebacks based on actual software usage
- Use more flexible licensing and pricing models
- Exploit detailed deployment data to perform return on investment analyses for purchased software

The license inventory manager is a three-tiered system that consists of a server tier, access point tier, and an agent tier. The server tier is the Symantec License Inventory Server, which consolidates and stores information that it gathers from the agents and access points.

The optional access point tier includes Symantec License Inventory Access Points and serves as a consolidation layer between the agents and server.

The agent tier includes Symantec License Inventory Agents, which are deployed on individual hosts in a network. Each agent gathers product information on the supported Symantec products that are installed on the agent's host, then sends the information to an access point or the server.

When the Symantec License Inventory Agent is installed

The Symantec product installer installs or upgrades the agent on the host with the Symantec product. The agent is installed in the following directory:

`/opt/SYMClma`

The agent is installed with a default configuration that minimizes its impact on a running system. The minimum configuration prevents remote communication with the agent to keep its data and interfaces secure.

When the server and access points are installed

The server and access points are not installed automatically. If you want to use the Symantec License Inventory Manager, you must manually install the server and, optionally, the access points. After you install the server and access points, the agents can gather information and you can create inventory reports.

You can install the server and access points from the Symantec License Inventory Manager installation disc.

What you can do with the agent after it is installed

If you are already participating in a Symantec sales program that requires the use of the agent, or if you want to order and deploy the Symantec License Inventory Manager, you can use the agent to track Symantec products on the systems on which it was installed. To use the agent, however, you must manually configure it to enable remote communication between the agent and its server or access point.

Complete instructions for reconfiguring the agent are provided in the *Symantec License Inventory Manager 4.1 Release Notes*. You can download this document from the following website:

http://support.veritas.com/docs/282183

How to remove the agent

If you do not want to use the Symantec License Inventory Manager, you can remove the agent using the operating system package removal commands to remove the agent packages, which include SYMClma and VRTSsmf.

The server and access point also use the VRTSsmf package. If the server or access point is installed on this host with the agent, you can remove the SYMClma package, but not the VRTSsmf package. If neither the server nor the access point is installed on this host, you can remove both the SYMClma and VRTSsmf packages.

If you remove both packages, remove the SYMClma package first.

Table C-1 lists the commands required to remove these packages on the supported platforms.

Table C-1 Package removal commands required to remove the agent

Platform	Package removal command
AIX	`installp -u VRTSlma` `installp -u VRTSsmf`
HP-UX	`swremove SYMClma` `swremove VRTSsmf`
Linux	`rpm evv SYMClma` `rpm evv VRTSsmf`
Solaris	`pkgrm VRTSlma` `pkgrm VRTSsmf`

Later, you can reinstall the agent with the Symantec License Inventory Manager installation disc. This disc is available in the Symantec License Inventory Manager kit.

How to order the Symantec License Inventory Manager license and media kit

To order a Symantec License Inventory Manager license and media kit, contact your Symantec sales representative.

The installation media provides online documentation for the Symantec License Inventory Manager. You can contact your sales representative to order printed copies of the documentation. The documents you can order include:

- *Symantec License Inventory Manager Installation and Configuration Guide*
- *Symantec License Inventory Manager Administrator's Guide*
- *Symantec License Inventory Manager User's Guide*

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